A330-200/300
TECHNICAL TRAINING MANUAL
MAINTENANCE COURSE - T1 (LVL 2&3) (GE/US)
STRUCTURE

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STRUCTURE

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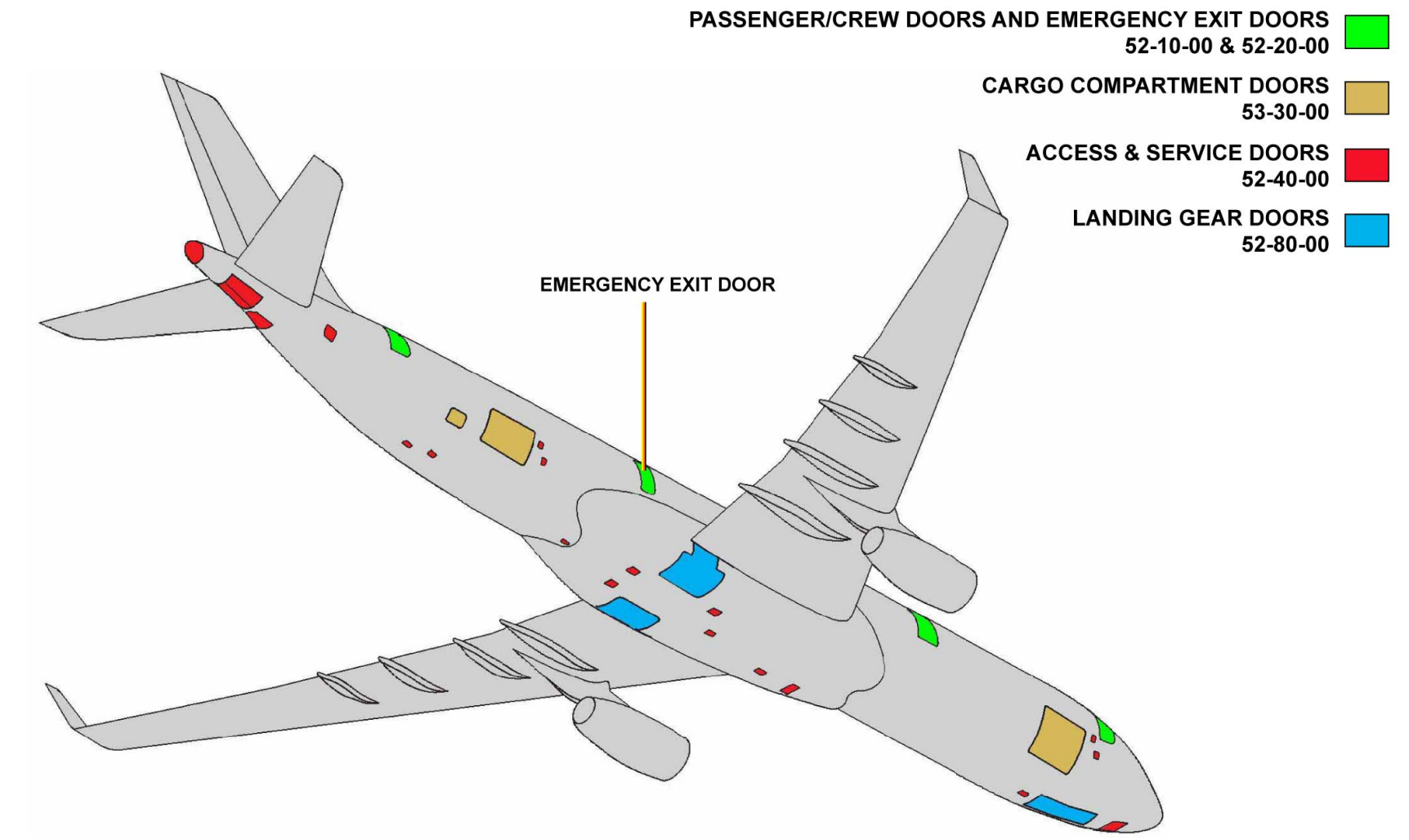
DOORS D/O (3)

GENERAL

The fuselage has:
- 6 type A (1.93 m (76 in.) x (1.07 m (42 in.)) passenger doors,
- 2 type I (0.61 m (24 in.)) x 1.66 m (65 in.) emergency exit doors,
- 2 cargo compartment doors,
- 1 bulk cargo compartment door,
- landing gear bay doors and access doors for servicing and maintenance.


PASSENGER/CREW DOORS AND EMERGENCY EXIT DOORS
52-10-00 & 52-20-00
CARGO COMPARTMENT DOORS
53-30-00
ACCESS & SERVICE DOORS
52-40-00
LANDING GEAR DOORS
52-80-00
EMERGENCY EXIT DOOR

GENERAL

DOORS D/O (3)

PASSENGER DOORS

Passenger doors:
The aircraft has six passenger doors (type A), located on each side of the fuselage at frames (Fr) 14/16A, Fr 33/35A and 73A/75A.
normal operation of the door is possible from the inside and the outside of the aircraft. Emergency operation is only possible from the inside. The doors are of fail-safe, plug-type construction. The door structure is of conventional design, composed of outer and inner skins, segments, beams and two lateral frames on which are fixed hinge fittings and locking mechanisms. The loads resulting from cabin pressure are transferred by eight stops located on each side of the door.
Emergency exit doors:
Two additional type I passenger emergency exits, one on each side of the fuselage, are provided aft of the wing between Fr 53.5 and 53.7. The structural design and operation of these plug-type exits is similar to that of the main doors.
Pax and emergency exit doors have an evacuation system in the lower part of the door (slide or slide/raft).

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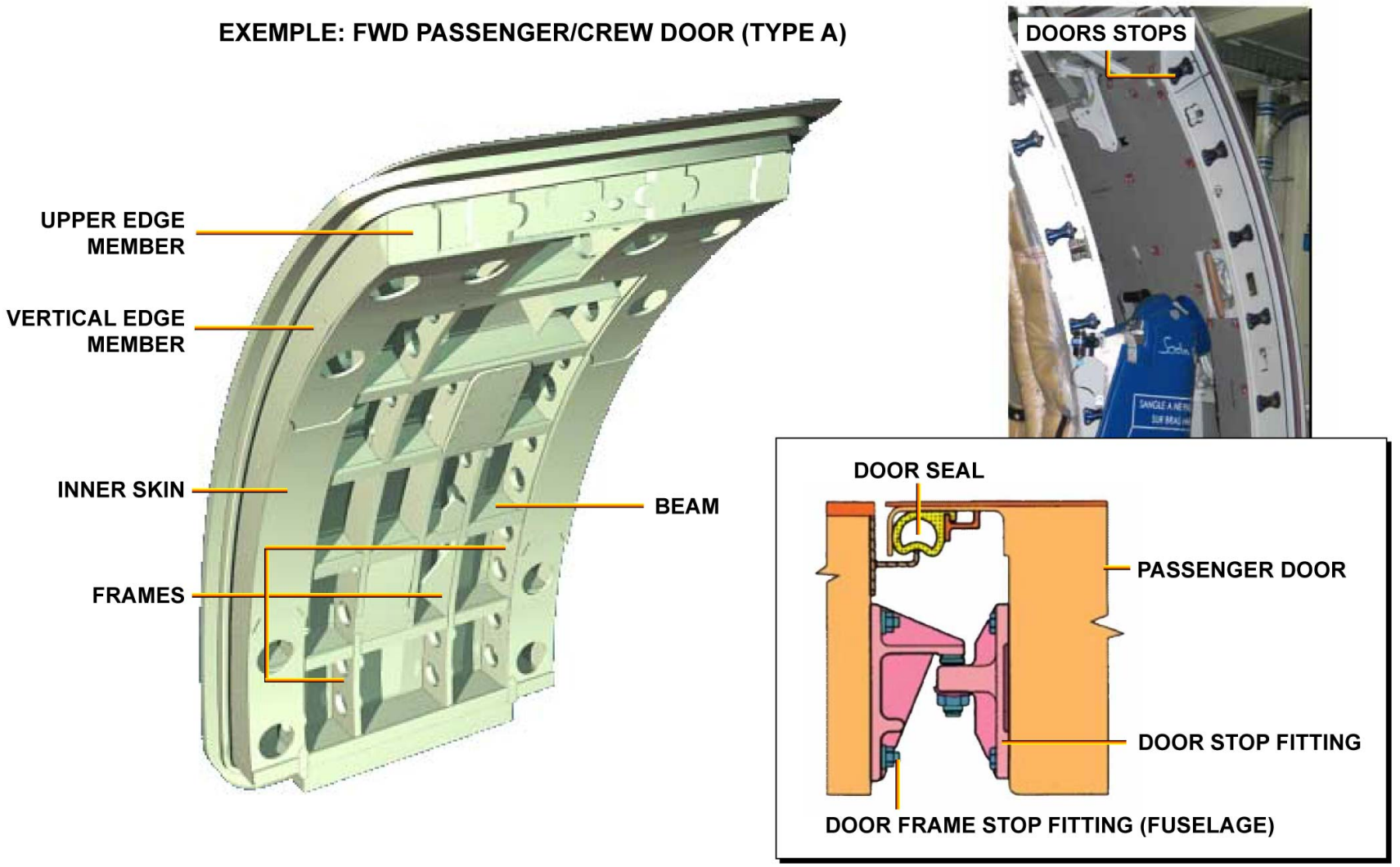


PASSENGER DOORS

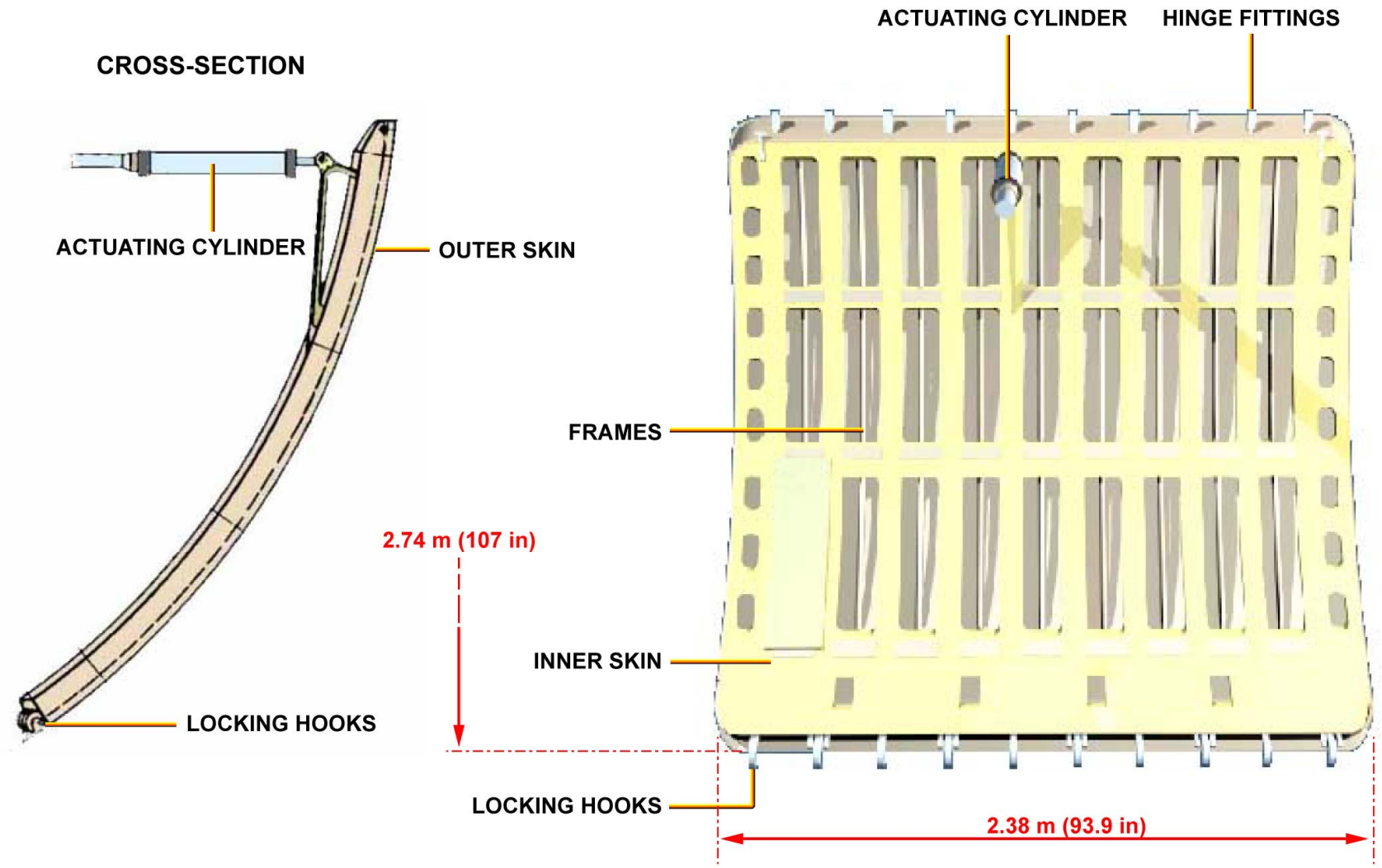
DOORS D/O (3)

CARGO COMPARTMENT DOORS

FWD & REAR CARGO DOORS

Two doors in the lower RH side of the fuselage give access to the main cargo compartments. The FWD door is located between Fr 20 and 25 and the aft door is located between Fr 59 and 65.
The doors are designed to carry the hoop tension loads from internal pressure. With this consideration, they are of conventional design and have:
- outer and inner skins,
- internal structure of drop-forged machined circumferential frames.

The upper ends of these frames are hinges for the door, and the lower ends are attachment for the locking hooks.



CARGO COMPARTMENT DOORS - FWD & REAR CARGO DOORS

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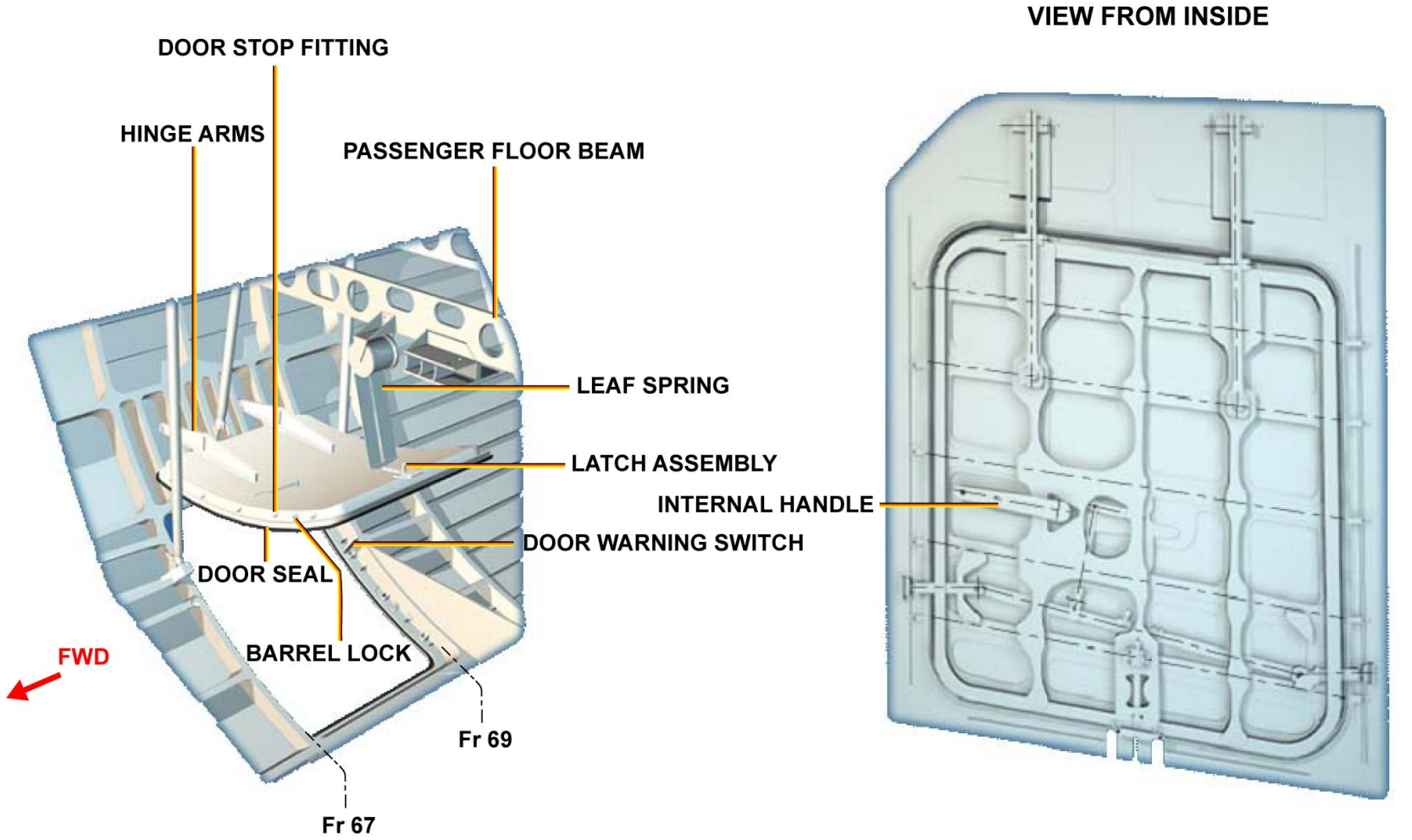
DOORS D/O (3)

CARGO COMPARTMENT DOORS (continued)

BULK CARGO DOOR

The bulk compartment, at the rear, has a conventional plug-type door, located between Fr 67 and 69.
The door is operated, locked and unlocked manually. It is opened by being pushed inward and upward and is locked in the open position on the ceiling of the compartment (In this compartment nets are provided to maintain the clearance for the door opening). The weight of the door is compensated by a tension spring. The door is connected to the door locking warning system.



CARGO COMPARTMENT DOORS - BULK CARGO DOOR

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DOORS D/O (3)

ACCESS & SERVICE DOORS

Access doors are installed in the aircraft to enable inspection of the structure and to give access to maintenance. Service doors are installed in the fuselage to get access to the servicing of systems.
All access and service doors are manually opened and closed.
Access and service doors are illustrated as follows:
- Avionics compartment door: the avionics compartment access door is installed at the bottom of the fuselage in a pressurized area of the aircraft. It is installed between Fr 7 and Fr 10. The door can be opened from the inside or the outside.
- Ram Air Turbine (RAT) door: the RAT door is installed at the RH side flap track fairing n° 4. A spring strut keeps the door in the closed position.
- APU (Auxiliary Power Unit) access doors: the APU access doors are installed in the fuselage tail cone. They are the lower part of the fuselage between Fr 95 and Fr 101. These doors give you access to the APU for maintenance.
The aircraft has access and service doors that are not illustrated; these doors are located in the fuselage and belly fairing for water, waste, external power and maintenance.

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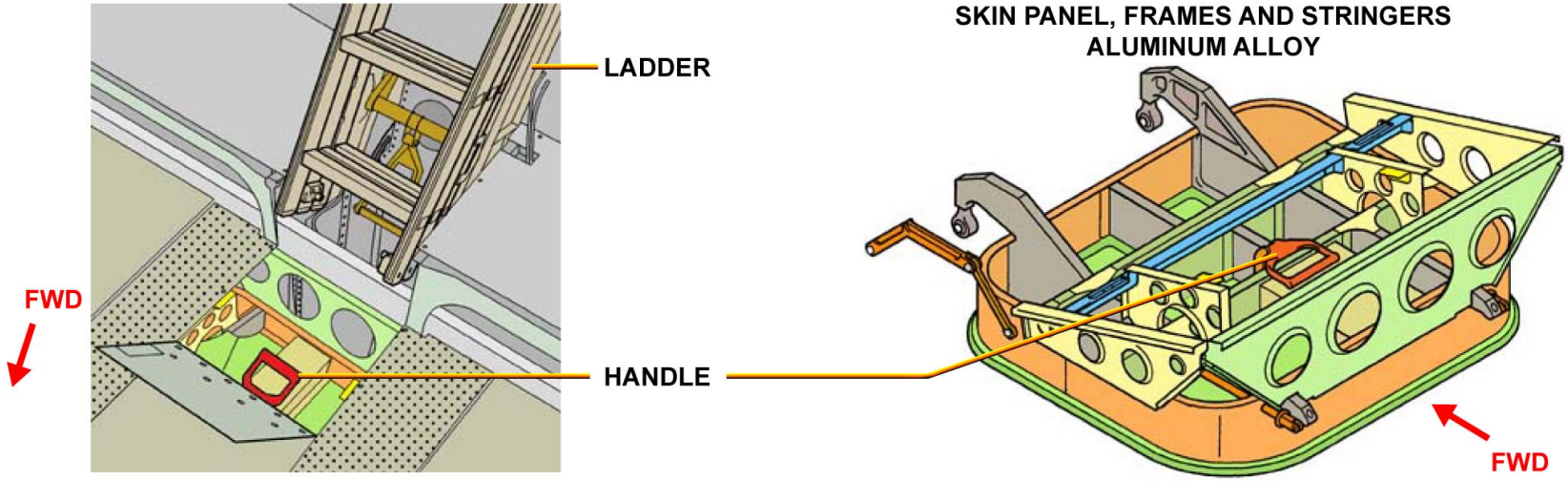
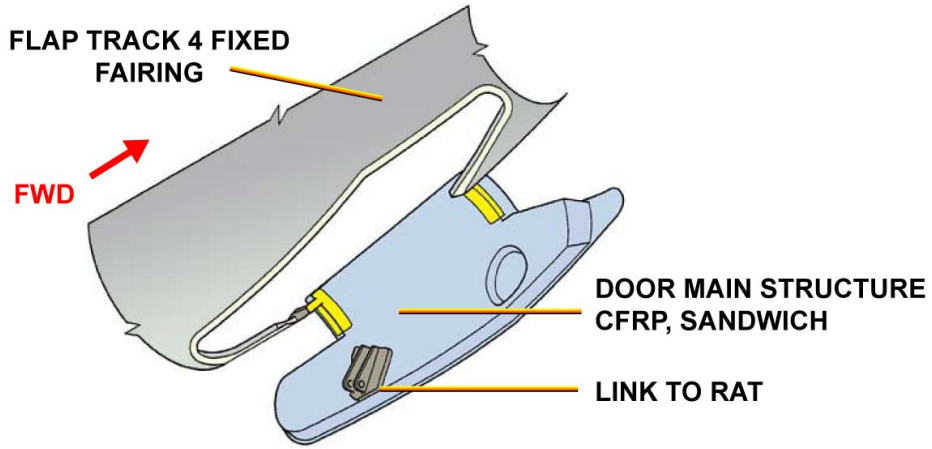
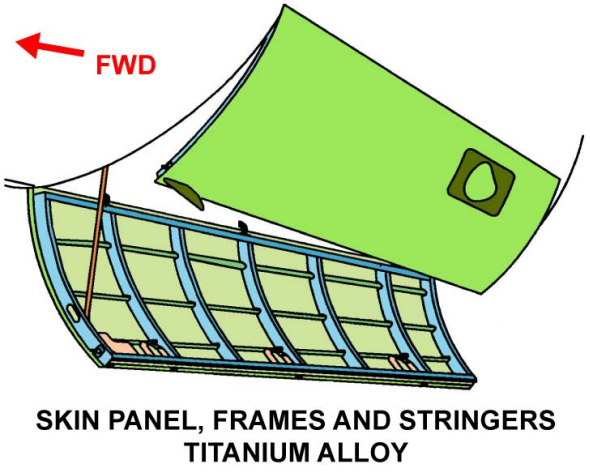
AVIONIC COMPARTMENT ACCESS DOOR



Ram Air Turbine (RAT) ACCESS DOOR



APU ACCESS DOORS



ACCESS & SERVICE DOORS

DOORS D/O (3)

LANDING GEAR DOORS

NLG (NOSE LANDING GEAR)

The landing gear doors give protection to the landing gear when the aircraft is in flight. The nose landing gear doors are located between Fr 11 and 17. The nose and auxiliary landing gear doors have five parts:

- two forward doors, hydraulically actuated, which can be closed with the gear in the extended or retracted position. These doors are made from CFRP (Carbon Fiber Reinforced Plastic) sandwich materials with honeycomb core. They are hinged to the landing gear bay longitudinal edges.
- two AFT doors, linked to the gear by a rotating rod, which are made from CFRP sandwich materials with honeycomb core. The purpose of these doors, hinged to the landing gear bay rear lateral edge, is to allow the FWD doors to be retracted when the gear is extended.
- one small door (fixed door) attached to the landing gear leg is made from aluminum alloy.

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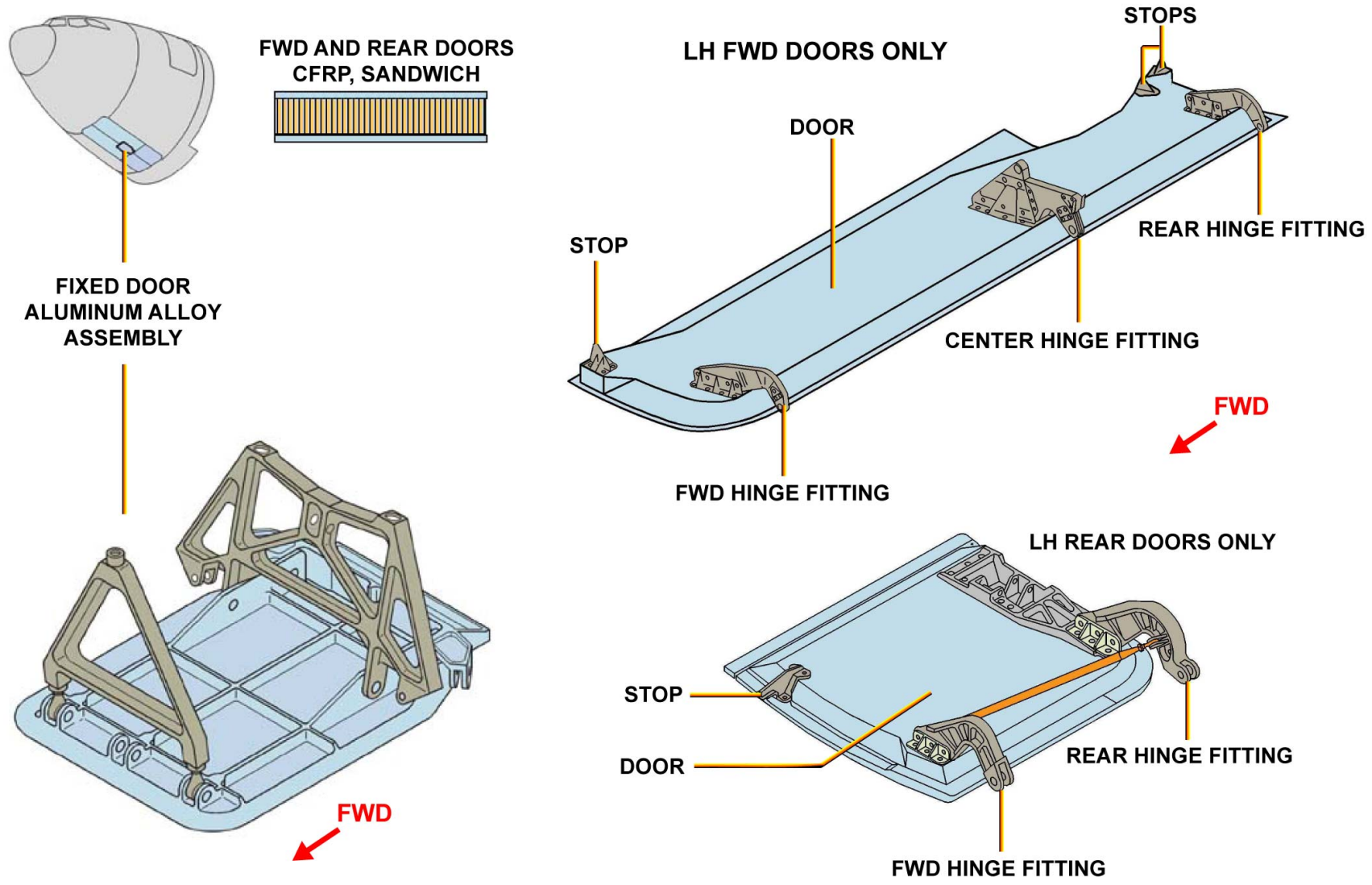

LANDING GEAR DOORS - NLG (NOSE LANDING GEAR)

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DOORS D/O (3)

LANDING GEAR DOORS (continued)

MLG (MAIN LANDING GEAR)

The main landing gear doors, located between Fr 47 and 53.2, are made from CFRP sandwich materials with honeycomb cores for each gear and have three parts:
- a main door, hydraulically actuated, is hinged to the fuselage keel beam parallel to the aircraft center line and can be closed with the gear in the extended or retracted position,
- a fairing attached to the gear leg (leg fixed fairing)): refer to ATA32 chapter,
- a small door hinged to the wing structure in the neighborhood of the upper end of the main leg (hinged door)): refer to ATA32 chapter.

All doors are part of the fuselage belly fairing and wing bottom surface in closed position.

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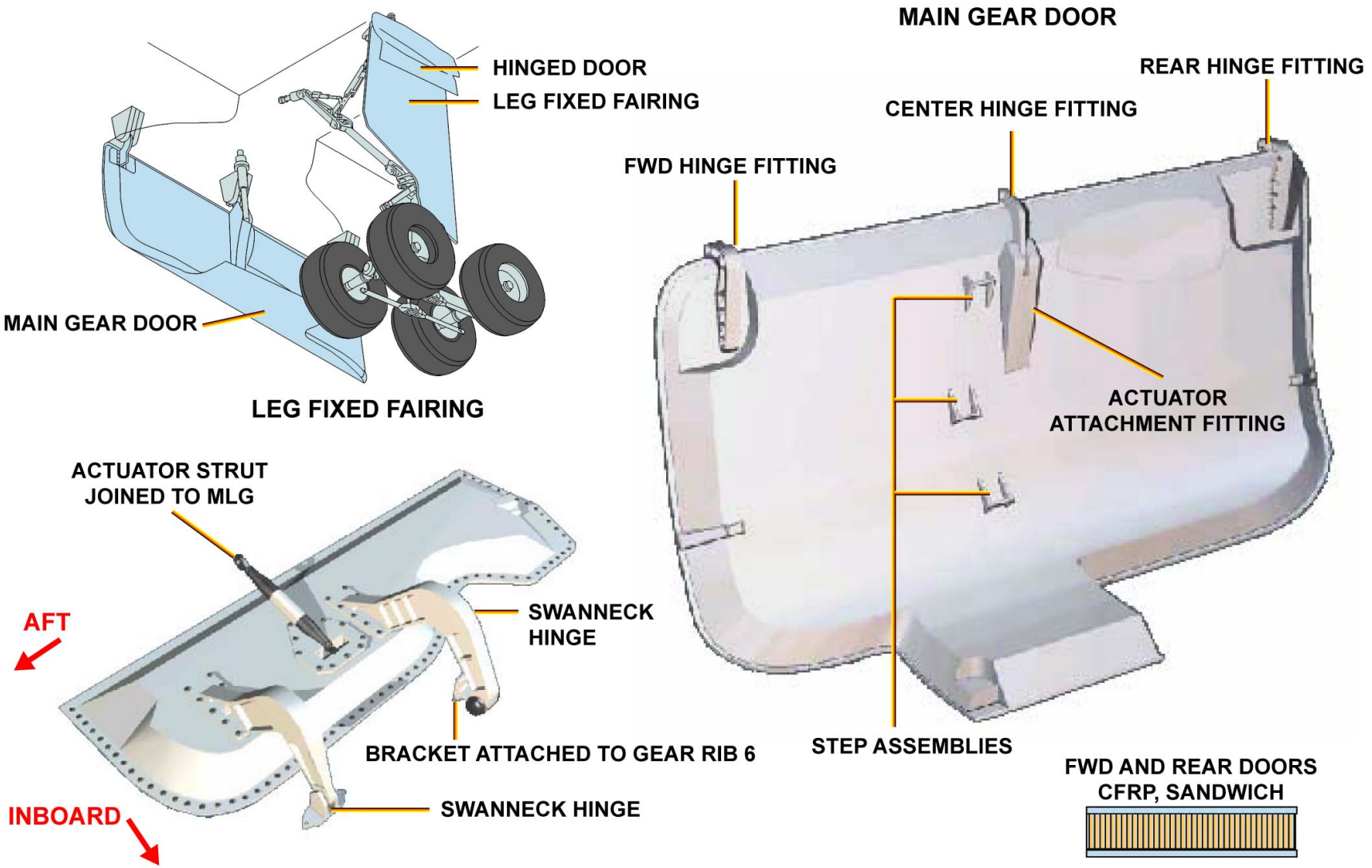

LANDING GEAR DOORS - MLG (MAIN LANDING GEAR)

FUSELAGE D/O (3)

GENERAL ARRANGEMENT

The fuselage is divided into five main parts:
- the nose forward fuselage (section 11/12),
- the forward fuselage (section 13/14 and 14A for A330-300/A340-300),
- the center fuselage (section 15),
- the rear fuselage (sections 16/17,18),
- And the cone/rear fuselage (section 19/19.1).

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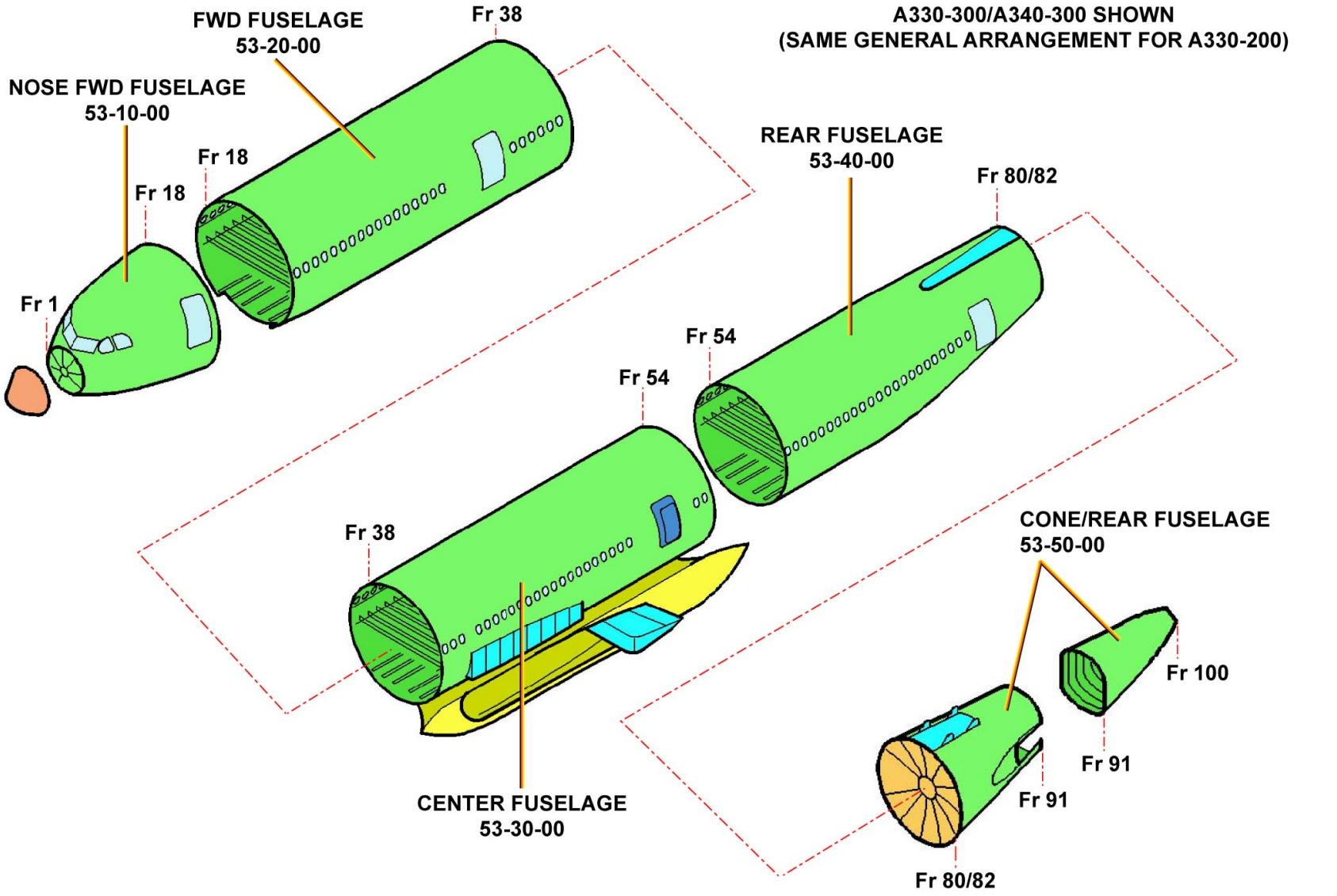

GENERAL ARRANGEMENT

FUSELAGE D/O (3)

NOSE FORWARD FUSELAGE

SECTION LAYOUT

The nose forward fuselage includes the section 11, between Frame (Fr) 1 and 10 and the section 12 between Fr 10 to Fr 18. The bottom skin panel extends up to Fr 19.
The main structure of the nose forward fuselage is divided into three parts:
- the forward upper structure (cockpit area) between Fr 1and Fr 10,
- the rear upper structure between Fr 10 and Fr 18,
- the lower structure between Fr 1and Fr 18.

The pressurized zone extends from Fr 1 to Fr 18. The unpressurized zones are the radome forward of Fr 1, the nose landing gear bay between Fr 10A and Fr 17 and the external power receptacle housing.

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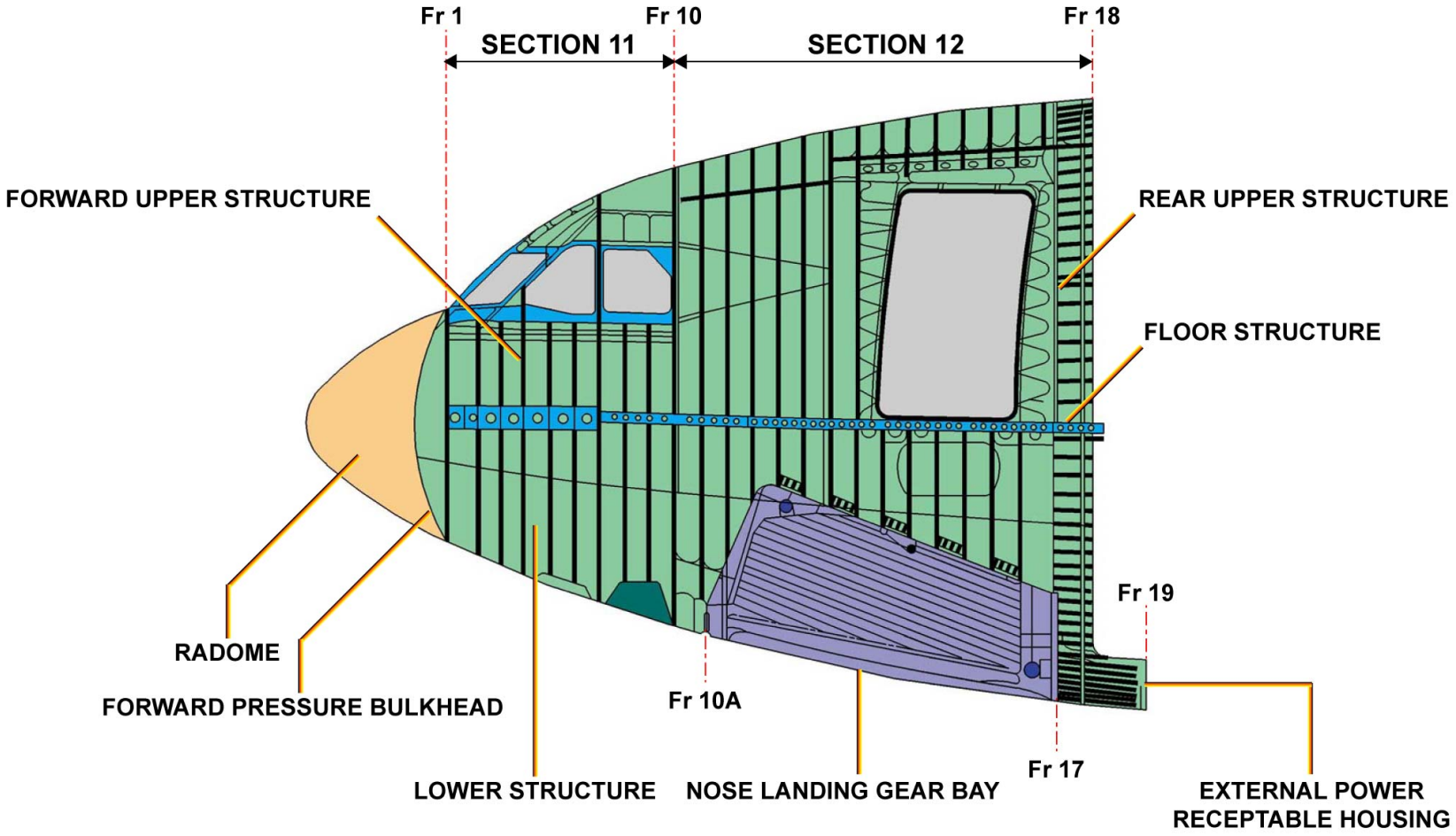

NOSE FORWARD FUSELAGE - SECTION LAYOUT

FUSELAGE D/O (3)

NOSE FORWARD FUSELAGE (continued)

FORWARD UPPER STRUCTURE

The forward upper structure between Fr 1 and Fr 10 includes:
- closed frames,
- opened frames at level of openings (windshield and side windows),
- the forward pressure bulkhead,
- the flight deck floor support structure,
- skin panels,
- the windshield structure.

The skin panels below and above the windshield are made of titanium alloy for bird impact protection.

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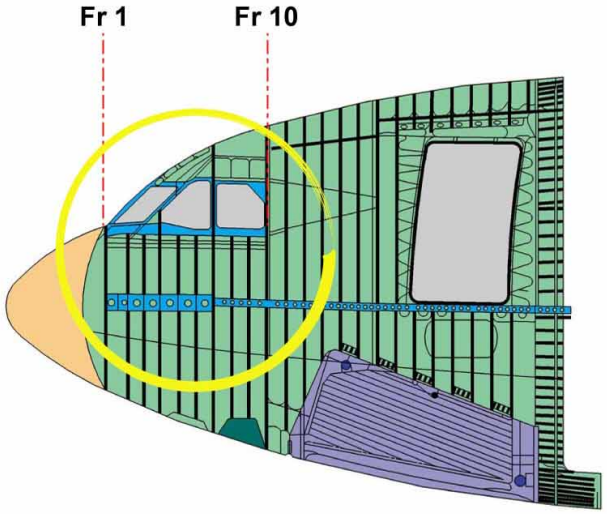

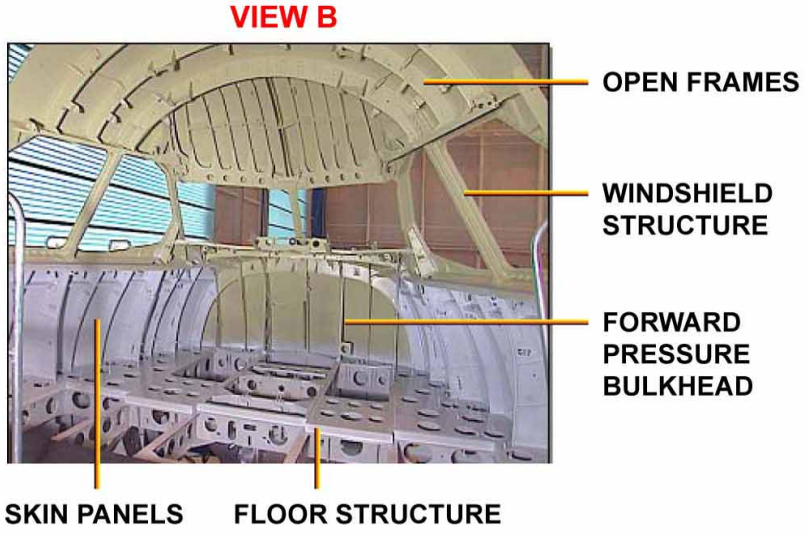

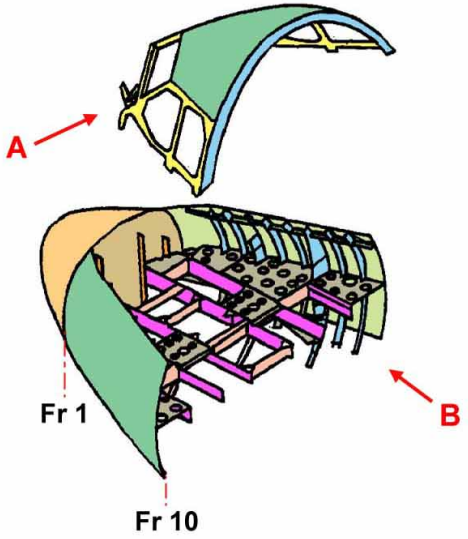

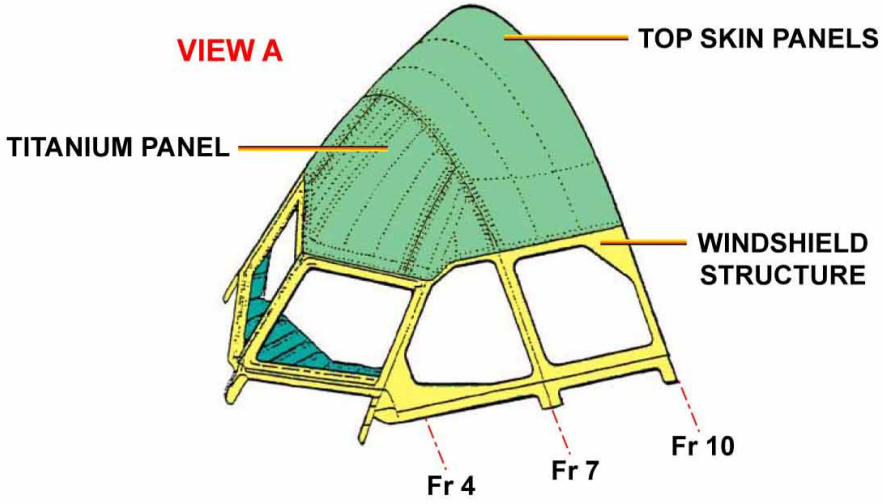

NOSE FORWARD FUSELAGE - FORWARD UPPER STRUCTURE

FUSELAGE D/O (3)

NOSE FORWARD FUSELAGE (continued)

REAR UPPER STRUCTURE

The upper structure between Fr 10 and Fr 18 is the forward part of the passenger cabin and includes:
- closed frames, stringers and skins,
- opened frames at level of opening for the passenger/crew door area,
- the passenger/crew door frame structure,
- the floor structure (including cross beams, seat rails and support rods connected to the nose landing gear bay).

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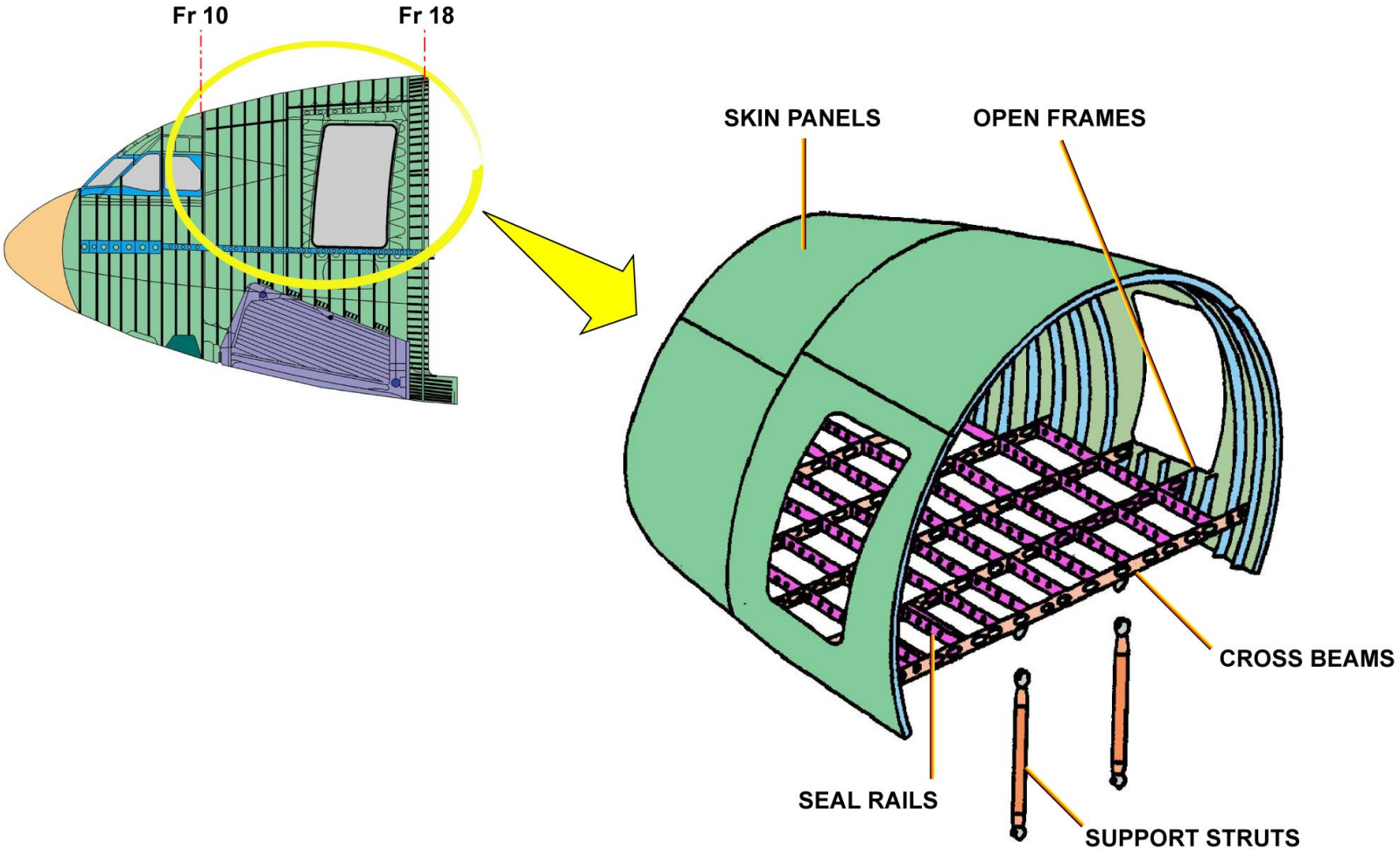

NOSE FORWARD FUSELAGE - REAR UPPER STRUCTURE

FUSELAGE D/O (3)

NOSE FORWARD FUSELAGE (continued)

LOWER STRUCTURE

The lower structure between Fr 1 and Fr 19 houses:
- the nose landing gear bay From Fr 10A to Fr 17,
- the jacking adapter located forward of Fr 10A,
- the avionics compartment access door,
- the external power receptacle housing.

The nose landing gear bay is an assembly of integrally machined panels stiffened by machined members, attached to the corresponding fuselage frames. The nose landing gear bay is reinforced by oblique struts at Fr 12A, 14 and 15A.

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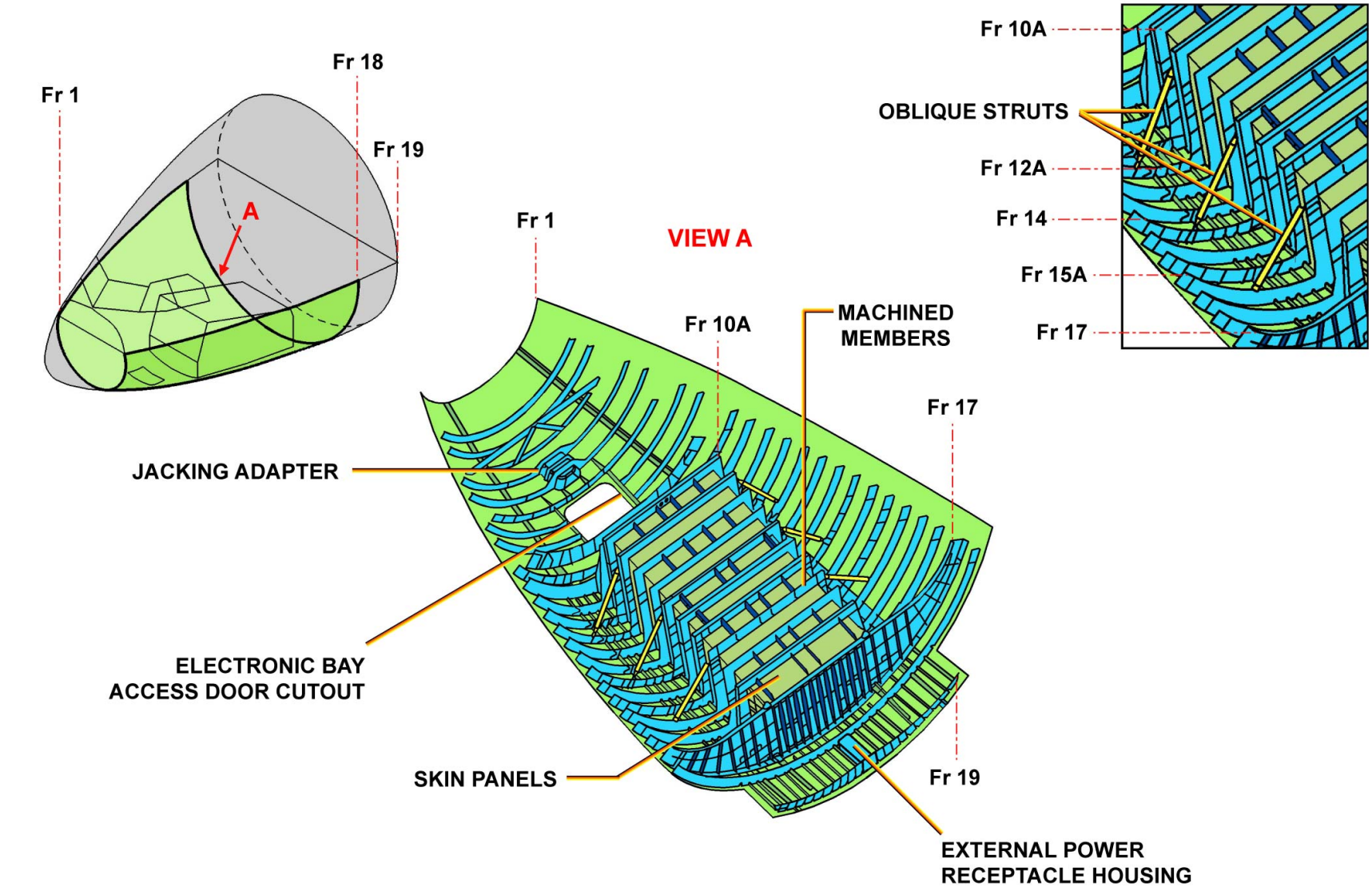

NOSE FORWARD FUSELAGE - LOWER STRUCTURE

FUSELAGE D/O (3)

FORWARD FUSELAGE

SECTION LAYOUT

The forward fuselage is divided into two main sections (13 and 14).
The A330-300 and A340-300 have an additional section 14A.
- section 13 extends between Fr 18 and 26,
- section 14 extends between Fr 26 and 38 for the A330-200,
- section 14 extends between Fr 26 and 37.1 for the A330-300.

The frame numbering of section 14 differs between the A330-200 and the A330-300/A340-300. The section 14A extends between Fr 37.1 and 38 and contains five frame bays.

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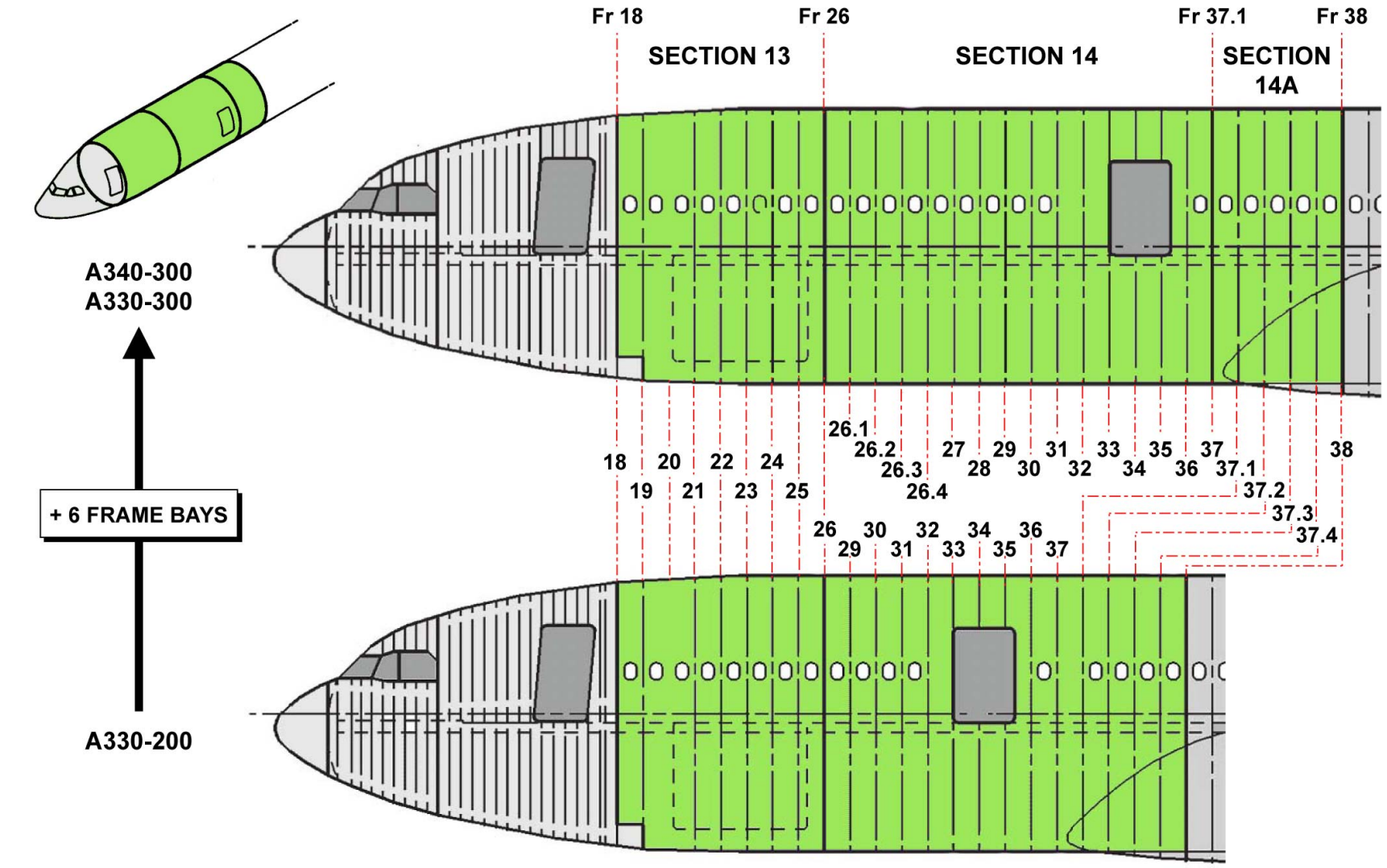

FORWARD FUSELAGE - SECTION LAYOUT

FUSELAGE D/O (3)

FORWARD FUSELAGE (continued)

PASSENGER & CARGO DOOR CUTOUTS

The upper part of the fuselage assembly contains:
- the forward section of the passenger cabin,
- the mid passenger/crew doors installed between Fr 33 and 36, left and right hand sides,
- the cabin window frames, installed between the fuselage frames, and Stringers (Stgr) 18 and 22.

The lower part of the fuselage assembly contains:
- the forward cargo compartment,
- the forward cargo door, installed on the right hand side of the fuselage, between Fr 20 and 26,
- a partition, installed at Fr 20, between the forward cargo compartment and the avionics compartment.

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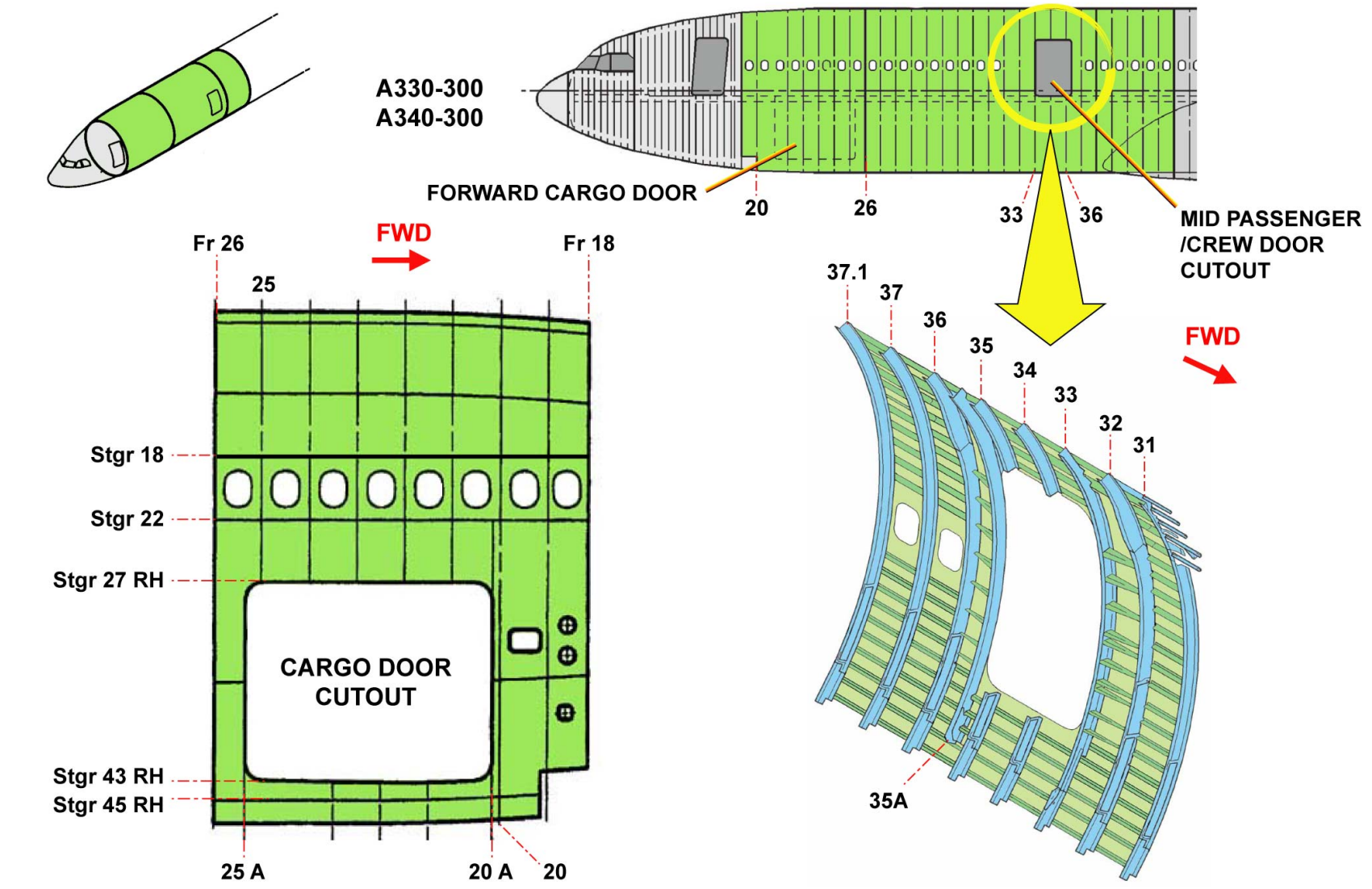


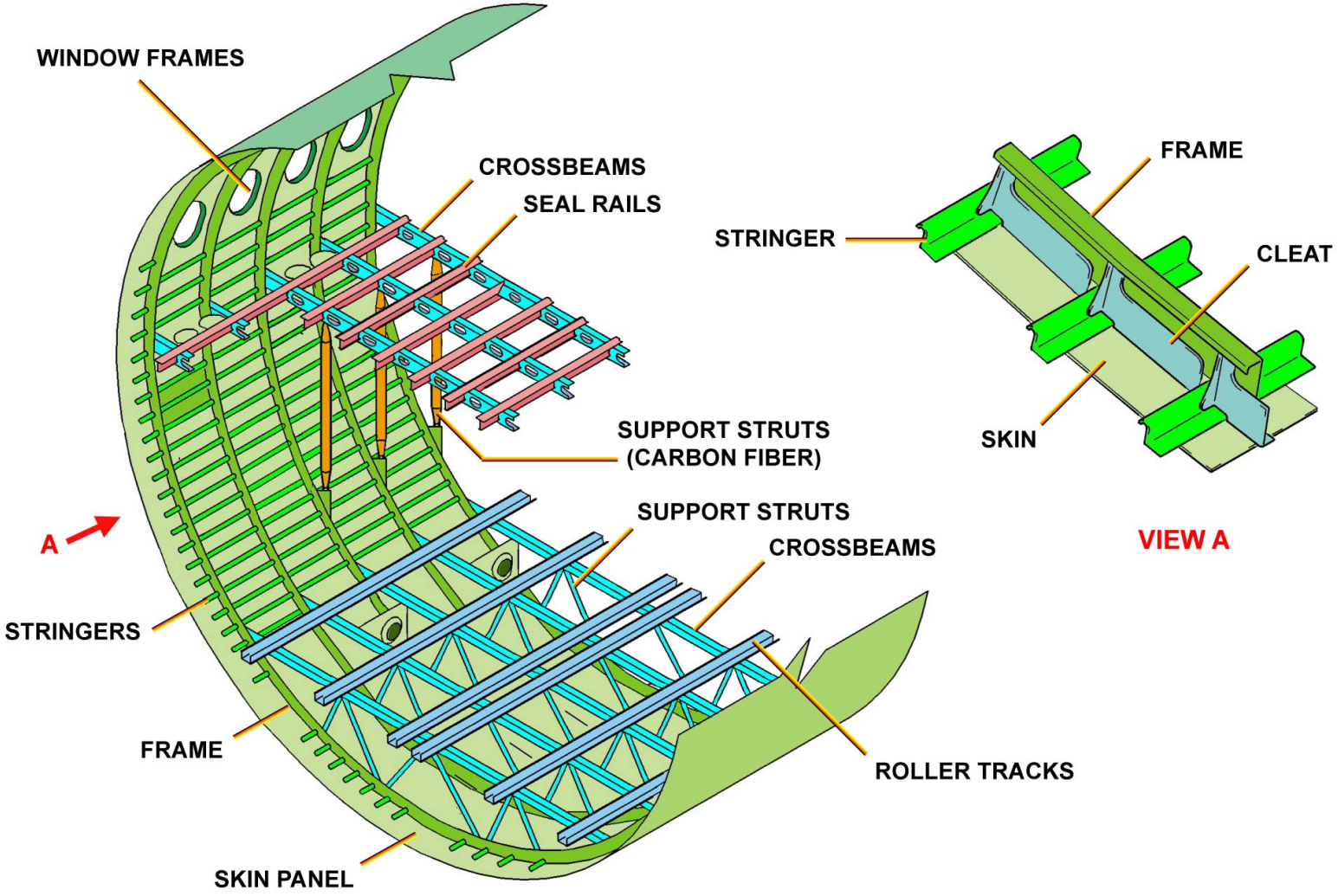
FORWARD FUSELAGE - PASSENGER & CARGO DOOR CUTOUTS

FUSELAGE D/O (3)

FORWARD FUSELAGE (continued)

TYPICAL FUSELAGE STRUCTURE

The structure is of conventional aluminum alloy design with skin panels, frames and stringers. The cabin floor structure has a floor panels supported by seat rails and cross beams. The floor structure of the cargo compartment has crossbeams attached to the frames and supported by struts. The roller tracks are attached to the crossbeams. The carbon fiber struts, which are supporting the cabin floor structure, are attached to the crossbeams and to the frames.



FORWARD FUSELAGE - TYPICAL FUSELAGE STRUCTURE

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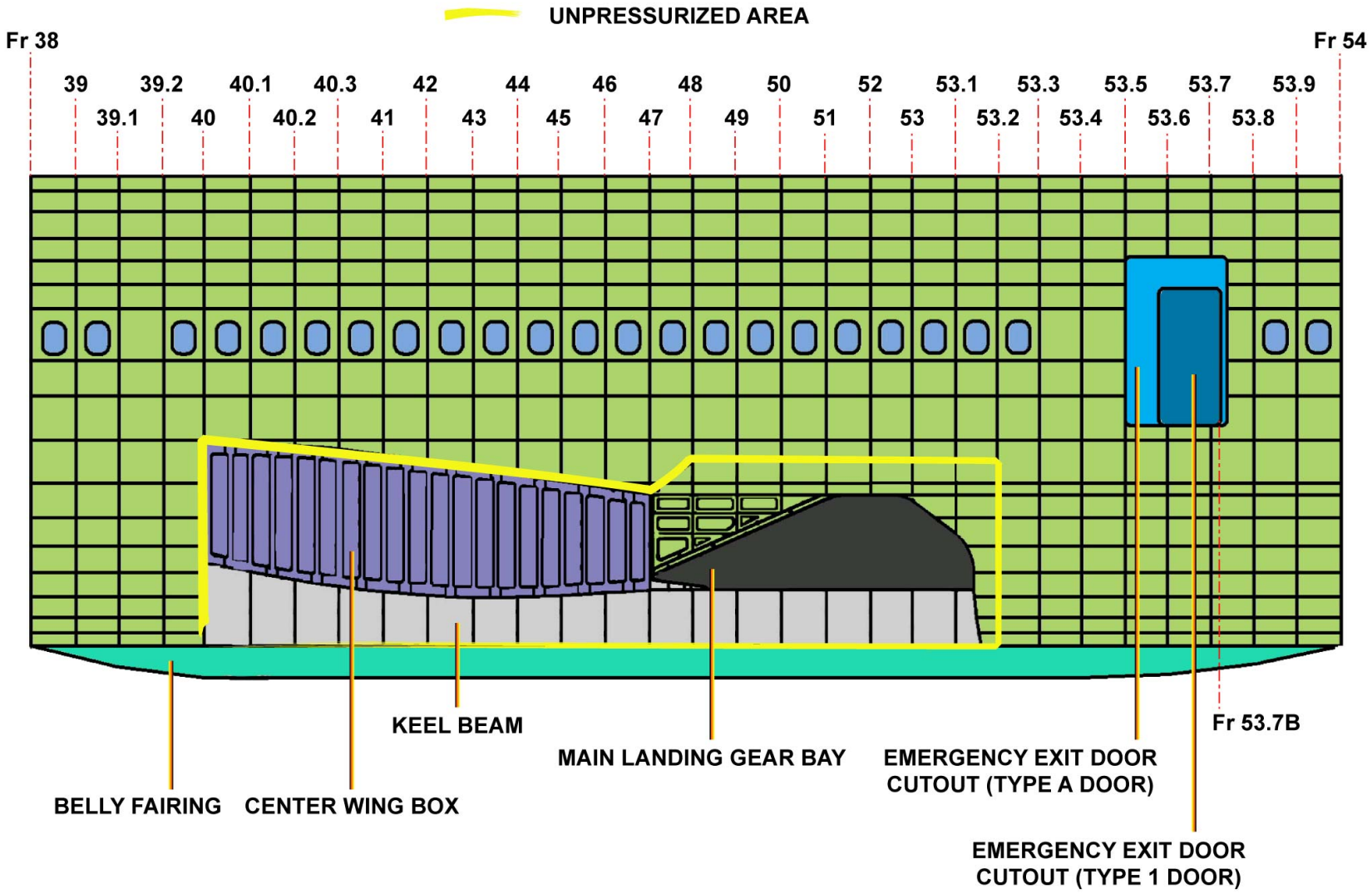
FUSELAGE D/O (3)

CENTER FUSELAGE

SECTION LAYOUT

The center fuselage (section 15) extends from Fr 38 to 54. It includes the emergency exit doors. The pressurized zones extend from Fr 38 to 54 in the upper fuselage, and from Fr 38 to 40 and Fr 53.2 to 54 in the lower fuselage. The unpressurized zones extend from Fr 40 to 53.2 in the lower fuselage.



CENTER FUSELAGE - SECTION LAYOUT

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FUSELAGE D/O (3)

CENTER FUSELAGE (continued)

STRUCTURE ARRANGEMENT

The fuselage upper section (from Fr 38 to 54) is composed of:
- frames, stringers, emergency exit frames, skin panels and floor support structure.

The fuselage lower section includes:
- the center wing box, which includes a forward pressure bulkhead (Fr 40) and the floor support structure,
- the keel beam between Fr 40 and Fr 46/53.3,
- the rear pressure bulkhead shaped by the lower member of frame 53.2,
- the horizontal pressure floor extending from the center wing box, Fr 47 to 53.2, with longitudinal beams and a cabin floor support structure,
- lateral pressure floors extending from Fr 47 to 53.2,
- the forward lower fuselage between Fr 38 and 40,
- the aft lower fuselage between Fr 53.2 and 54.

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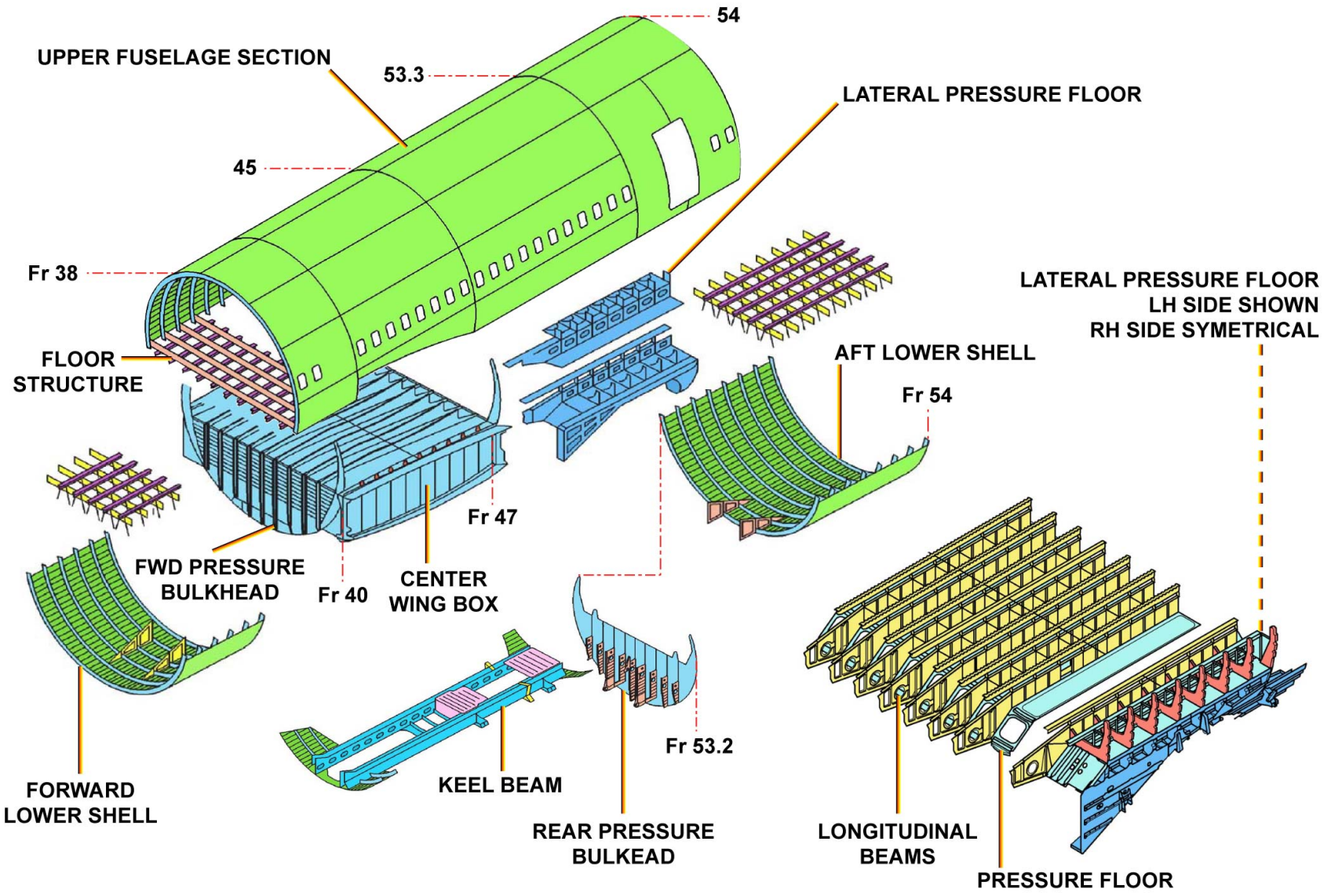


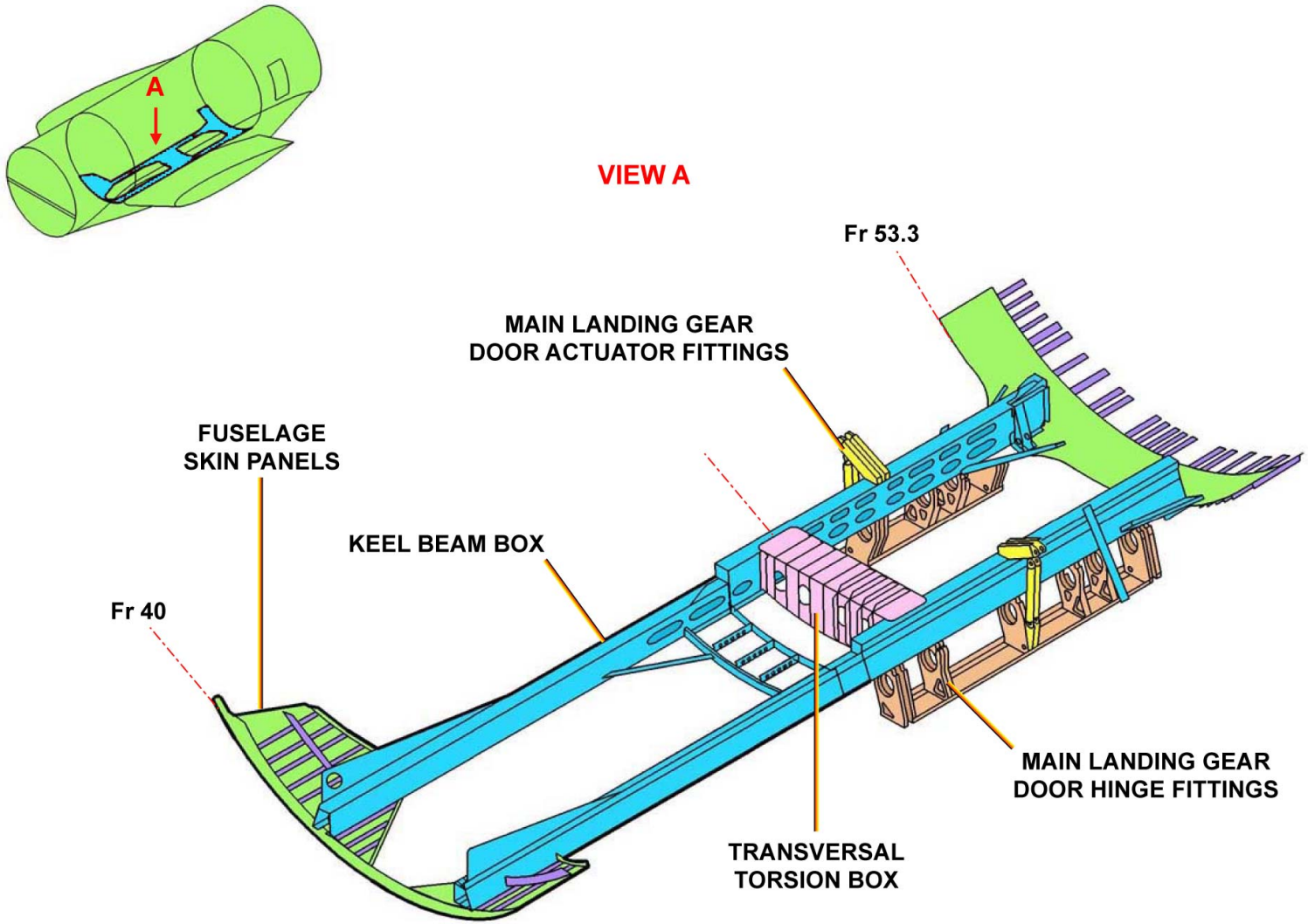
CENTER FUSELAGE - STRUCTURE ARRANGEMENT

FUSELAGE D/O (3)

CENTER FUSELAGE (continued)

KEEL BEAM

The keel beam is located between Fr 40 and 53.3.It gives the continuity of the fuselage in the area of the main landing gear bay.
The keel beam also supplies attachment points for the main landing gear doors (hinge and actuator fittings).
This beam includes two longitudinal box structures, attached to stiffened skin panels, machined ribs, and transversal torsion box (at Fr 47).



CENTER FUSELAGE - KEEL BEAM

FUSELAGE D/O (3)

CENTER FUSELAGE (continued)

BELLY FAIRING

The belly fairing extends between Fr 37.2 and 57.2.
It includes a sub-structure made of aluminum alloy frames and webs, which are attached to the fuselage via fittings and rods.
This substructure supports the sandwich panels made of composite materials (carbon and glass fiber).
The belly fairing also includes the landing gear doors, external access panels and access doors for maintenance.

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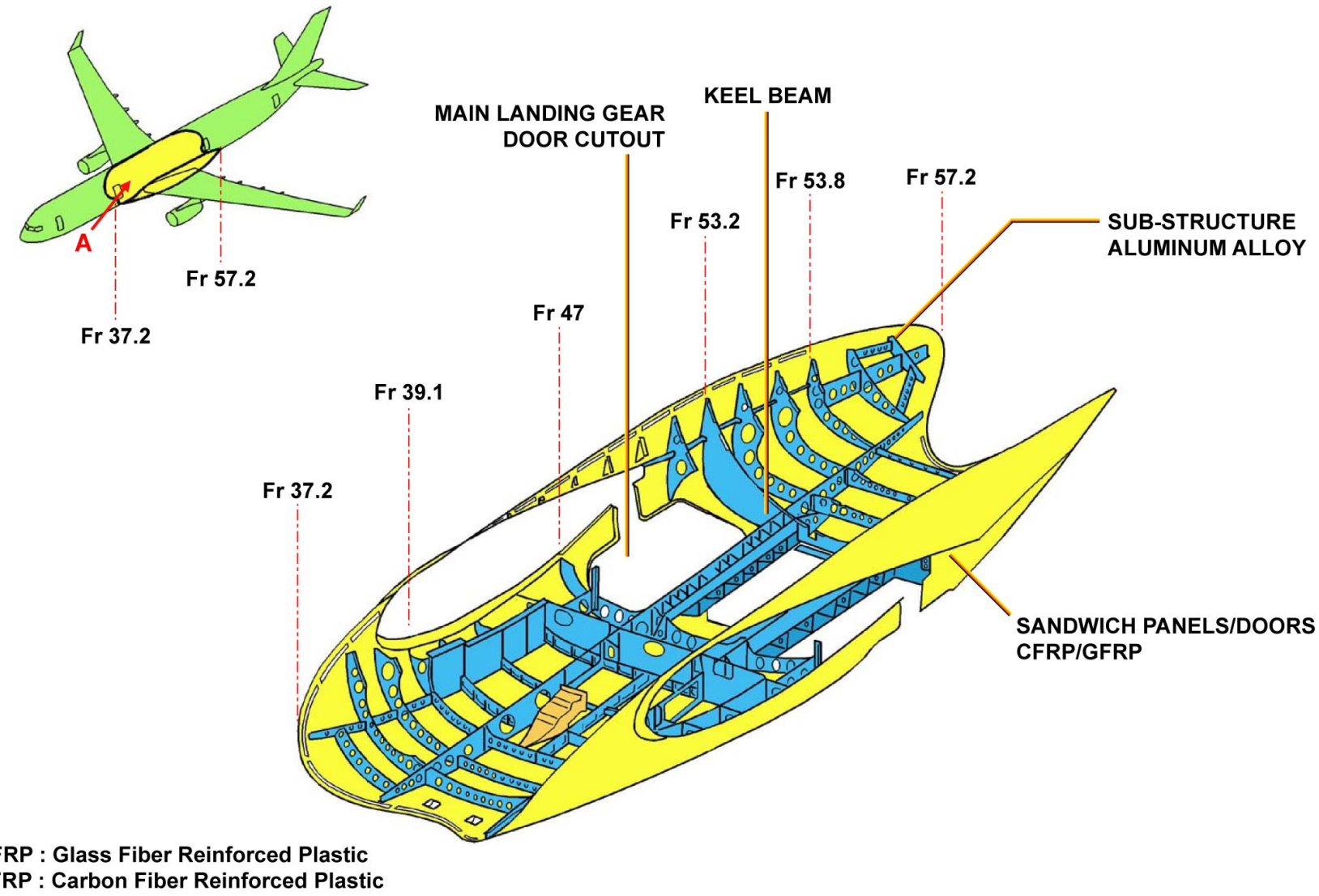

CENTER FUSELAGE - BELLY FAIRING

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FUSELAGE D/O (3)

REAR FUSELAGE - SECTION LAYOUT

The rear fuselage assembly is a pressurized area, which extends from Fr 54 to Fr 80/82 and contains sections 16, 17 and 18.
The section 16 of the A330-300 and A340-300 is 4 frame bays longer than the A330-200, and extends from Fr 54 to Fr 58.
Section 17 extends from Fr 58 to Fr 72 and section 18 extends from Fr 72 to Fr 80/82.
The structure of this section is of the same basic design as the forward fuselage.
The lower part of the fuselage assembly contains the rear cargo compartment and the rear cargo-compartment door, installed on the right hand side of the fuselage between Fr 59 and 65. This section is also fitted with a bulk cargo compartment and a bulk cargo door, installed on the right hand side of the fuselage between Fr 67 and 69.

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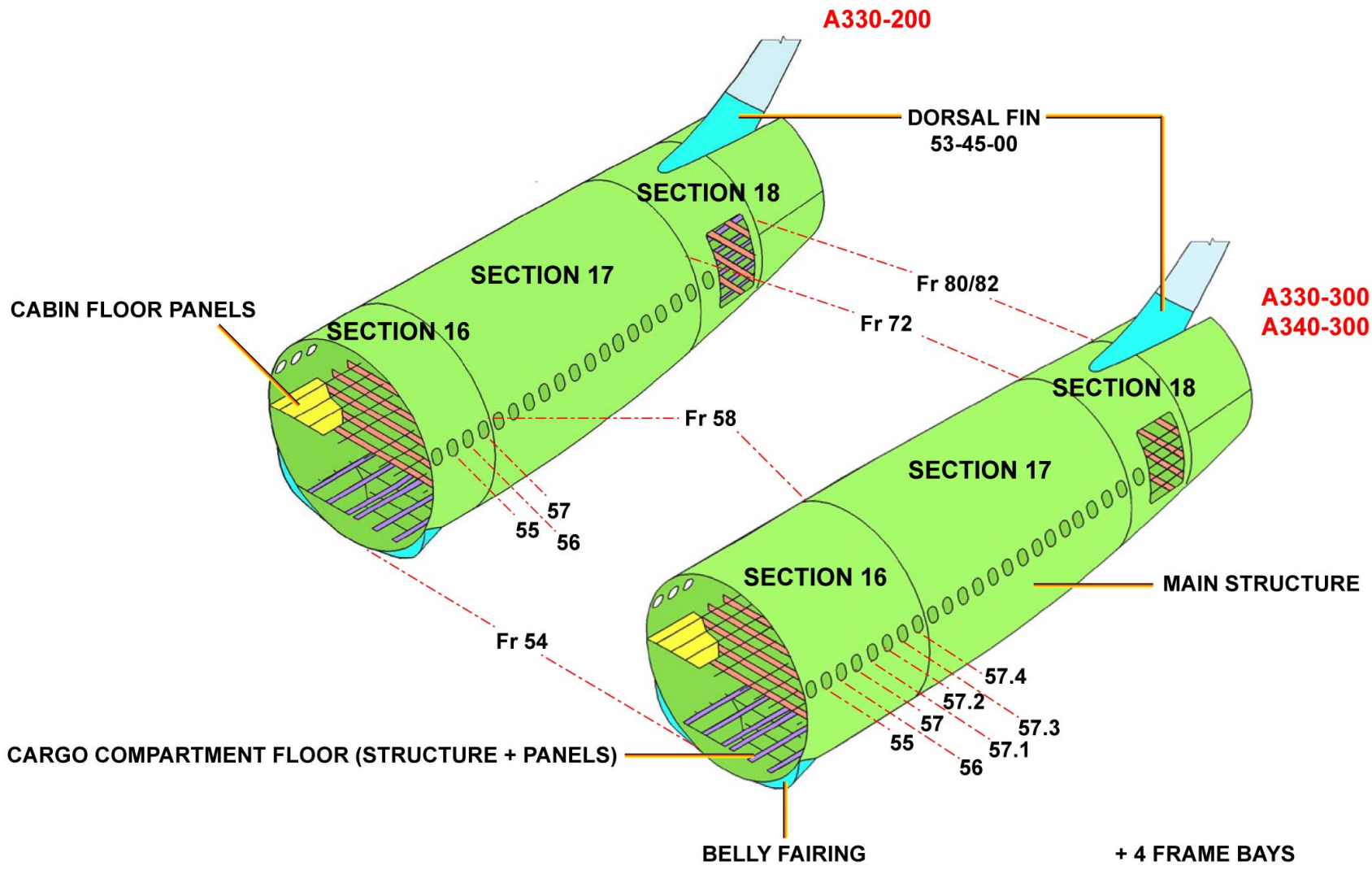

REAR FUSELAGE - SECTION LAYOUT

FUSELAGE D/O (3)

CONE/REAR FUSELAGE

The cone/rear fuselage assembly is an unpressurized area, which extends from Fr 80/82 to Fr 103. The upper skin panels aft of Fr 76 are also part of the assembly. Section 19, located between Fr 80 / 82 and 91, contains the rear pressure bulkhead installed at Fr 80 / 82, the attachment fittings for the vertical stabilizer, the attachment structure for the horizontal stabilizer and attachment fittings for the tail cone at Fr 91. The tail cone extends from Fr 92 to Fr 103.

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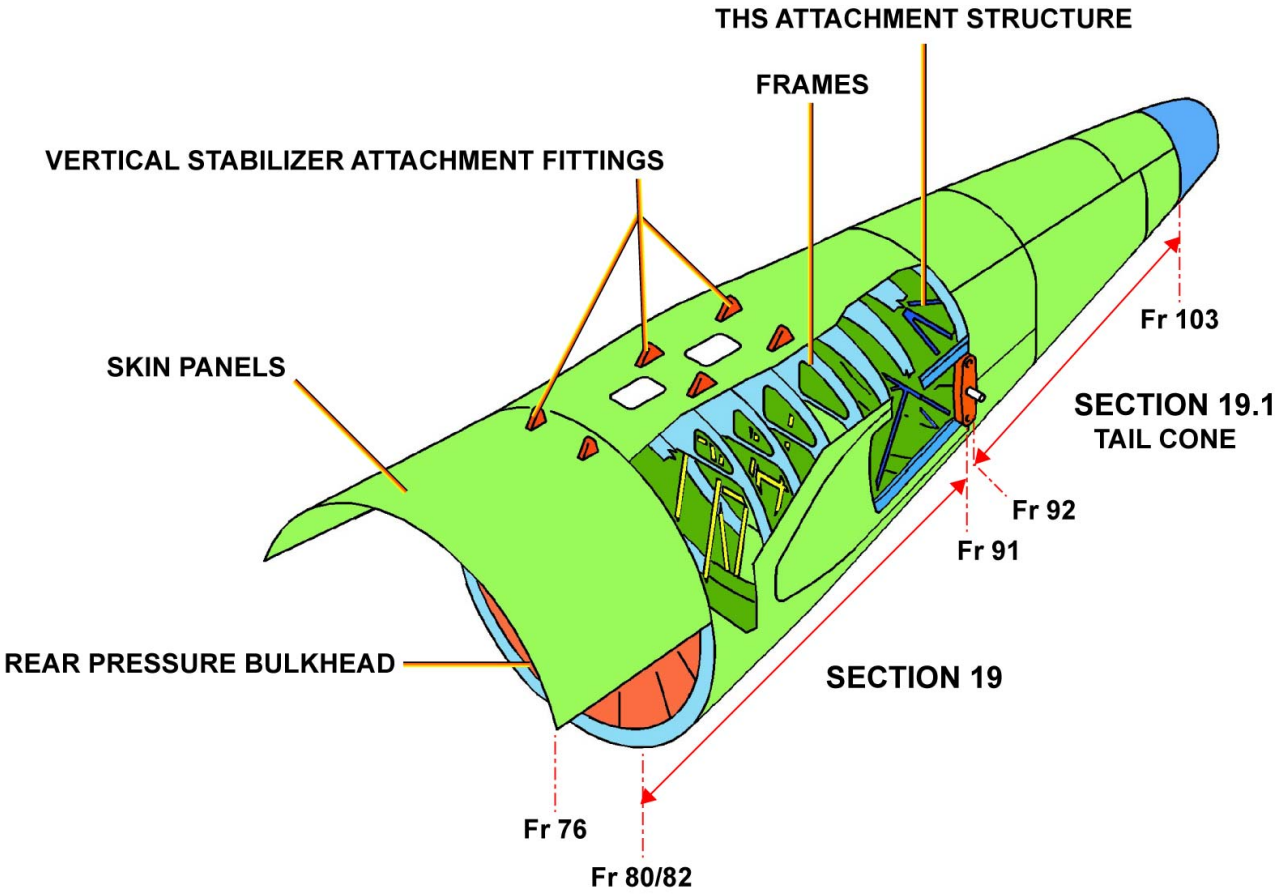


CONE/REAR FUSELAGE

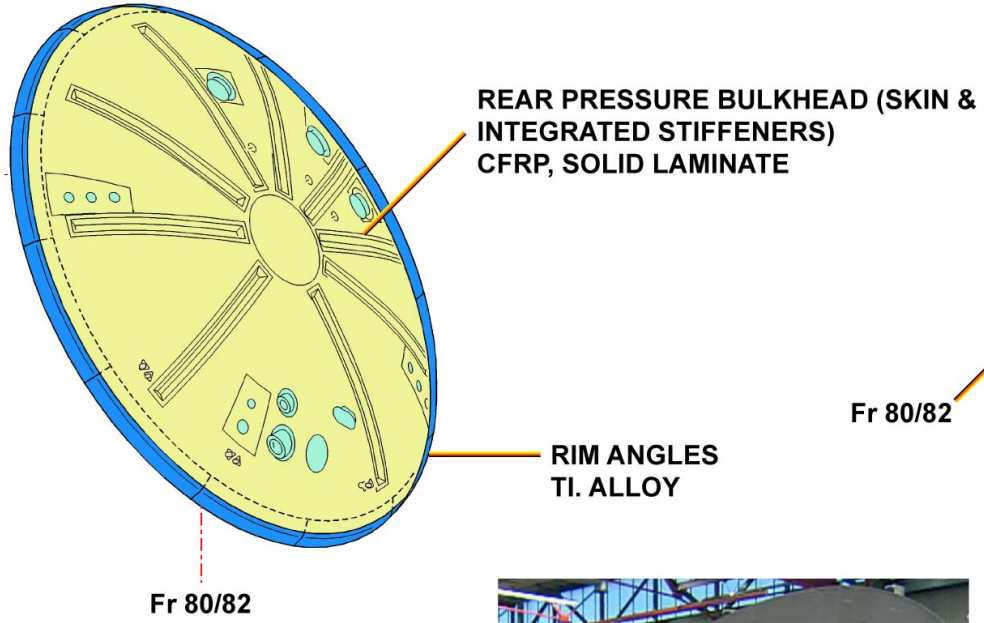
FUSELAGE D/O (3)

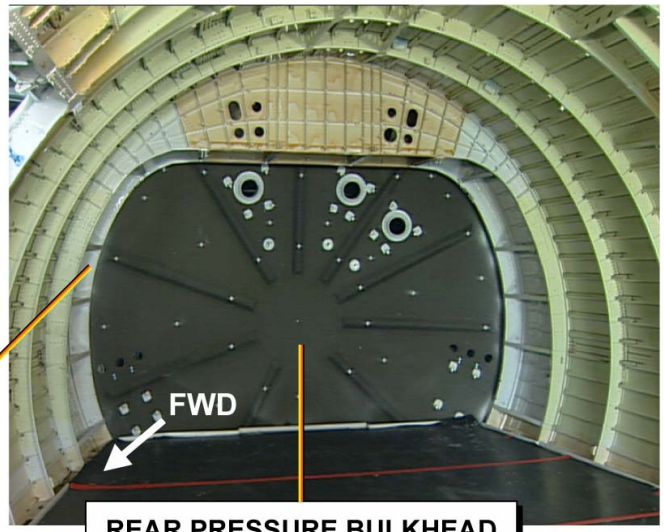
CONE/REAR FUSELAGE (continued)

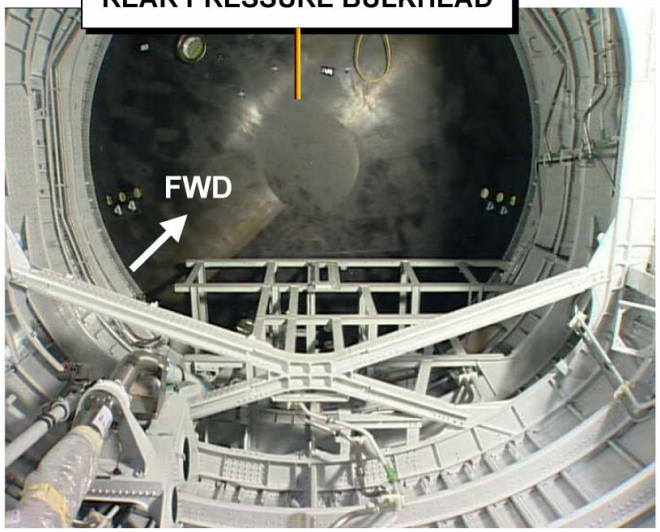
REAR PRESSURE BULKHEAD

The rear pressure bulkhead, installed at Fr 80/82,divides the pressurized rear fuselage from the cone / rear fuselage, which is not pressurized. It is a monolithic composite panel, made from carbon fiber and stiffened by nine stiffeners integrated to the front face (carbon fiber skin laminated on a foam core). The bulkhead is attached to the inside of the fuselage with 12 titanium rim angles.

G4J06491 - G0UT1M0 - FM51DX000000001







CFRP : Carbon Fiber Reinforced Plastic

CONE/REAR FUSELAGE - REAR PRESSURE BULKHEAD

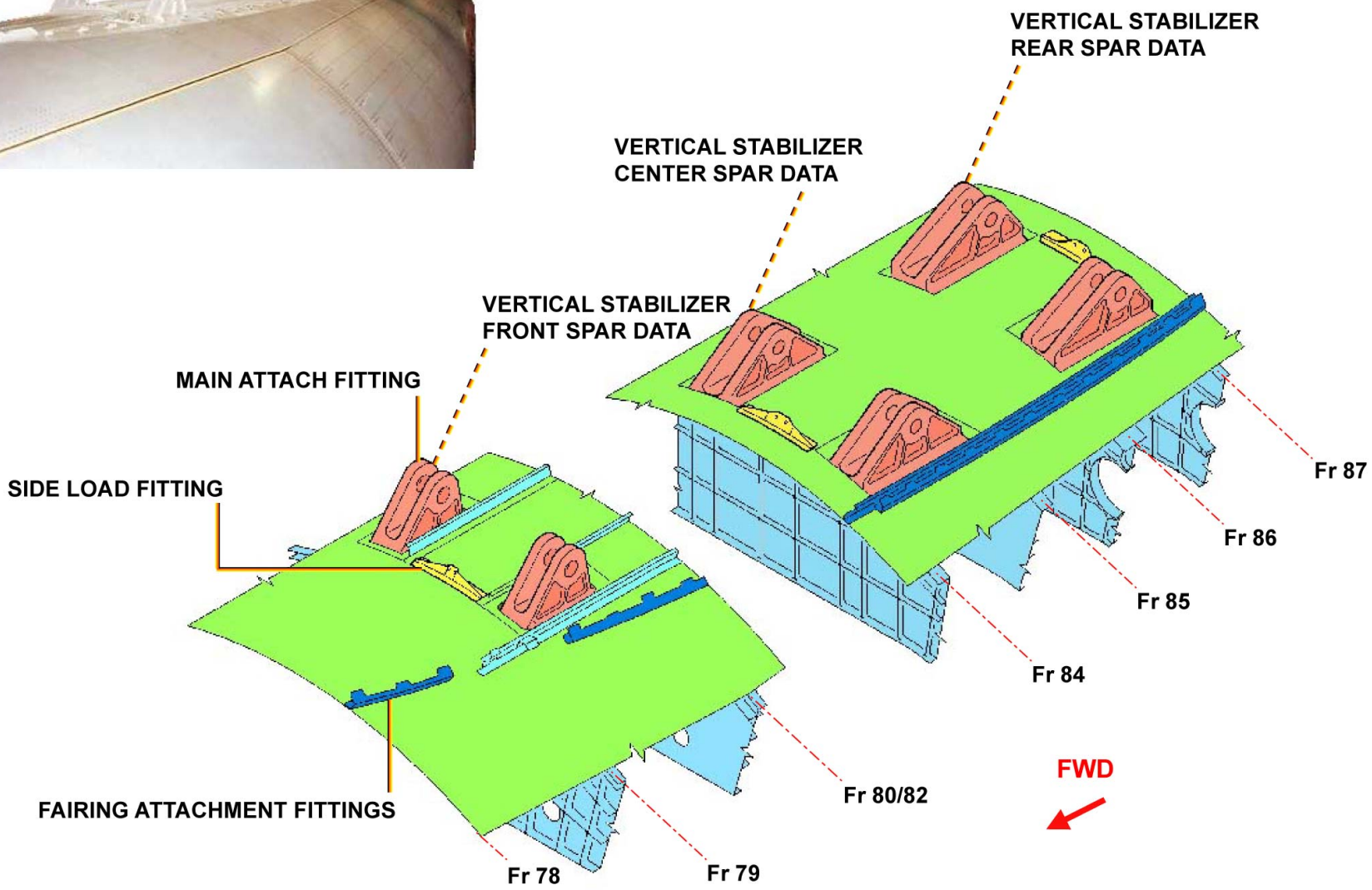
FUSELAGE D/O (3)

CONE/REAR FUSELAGE (continued)

VERTICAL STABILIZER ATTACHMENT FITTINGS

The vertical stabilizer attachment fittings are machined from aluminum alloy forgings.

G4J06491 - G0UT1M0 - FM51DX000000001



CONE/REAR FUSELAGE - VERTICAL STABILIZER ATTACHMENT FITTINGS

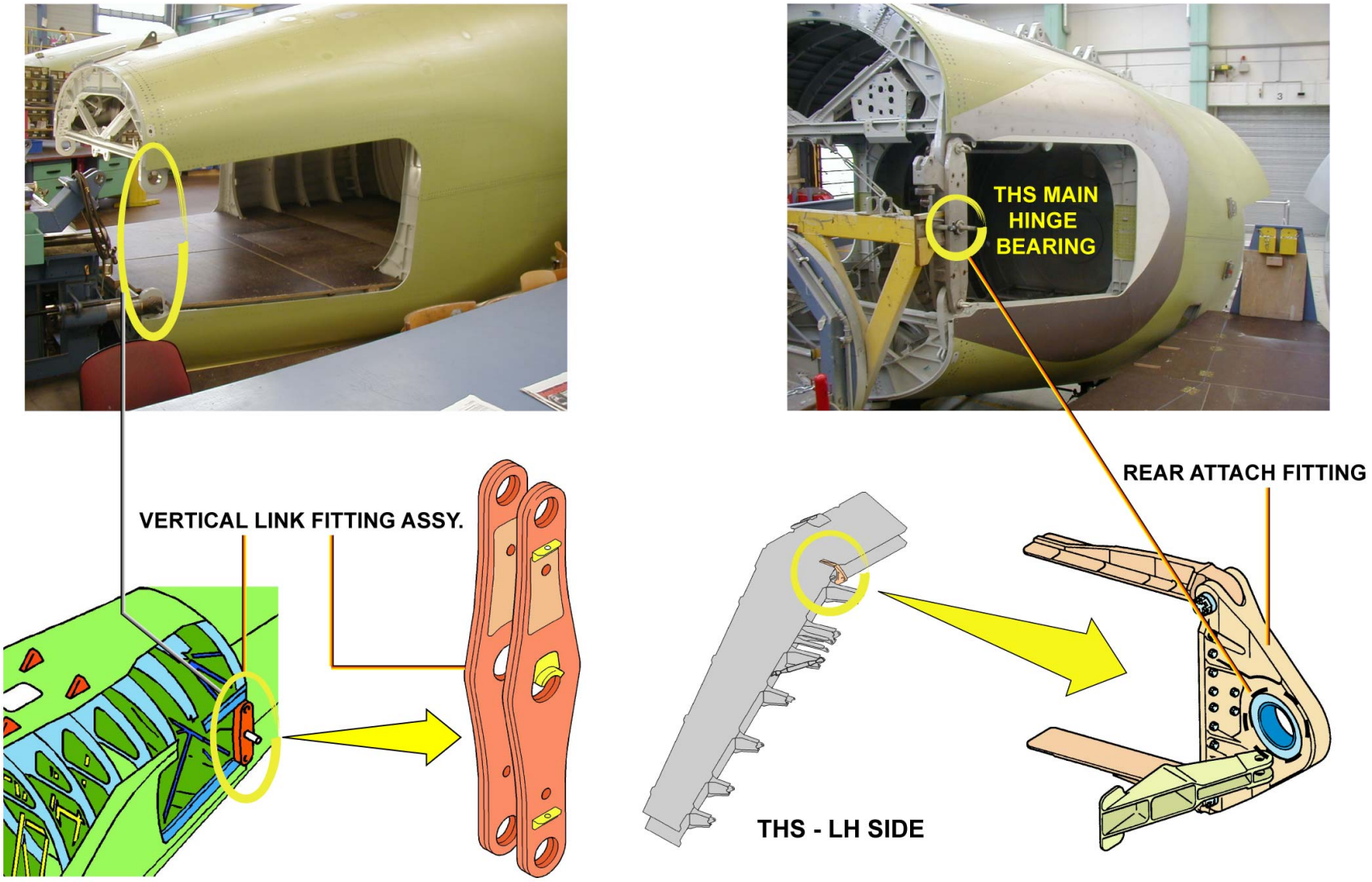
FUSELAGE D/O (3)

CONE/REAR FUSELAGE (continued)

THS ATTACHMENT FITTINGS

Attachment lugs for the THS rear attachment fittings are installed on the left and right sides of the upper and lower frame sections of frame 91. The upper and lower parts of frame 91 are integrally machined from aluminum alloy.

G4J06491 - G0UT1M0 - FM51DX000000001



CONE/REAR FUSELAGE - THS ATTACHMENT FITTINGS

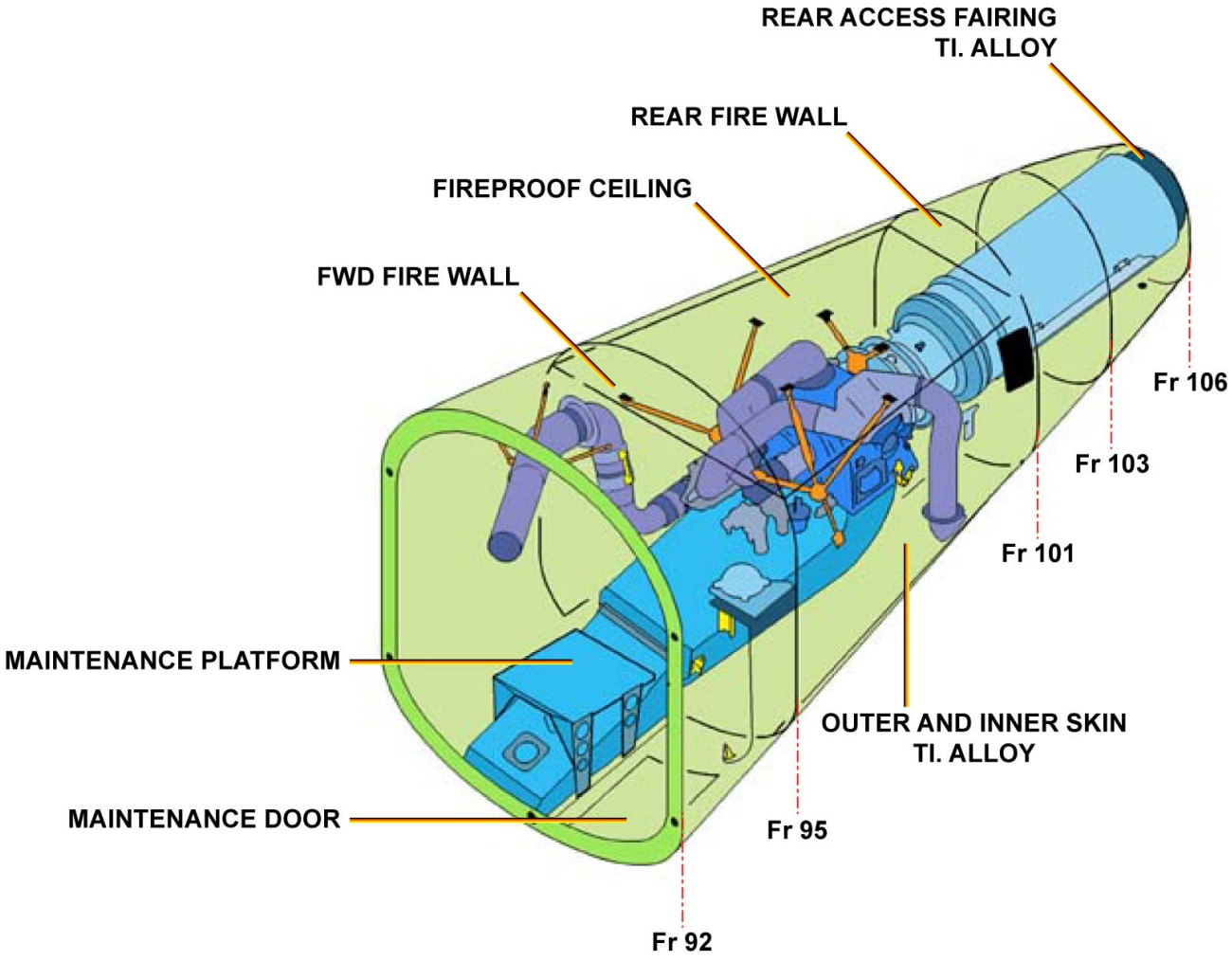
FUSELAGE D/O (3)

CONE/REAR FUSELAGE (continued)

TAIL CONE (SECTION 19.1)

The tail cone is attached to the cone/rear fuselage at Fr 91. You can remove the tail cone as a unit. The APU is installed in the tail cone (APU compartment) between Fr 95 and 101. The APU air intake is installed between Fr 92 and 95. The rear end of the tail cone, aft of Fr 103, is a sheet metal fairing for the APU exhaust.

G4J06491 - G0UT1M0 - FM51DX000000001



CONE/REAR FUSELAGE - TAIL CONE (SECTION 19.1)

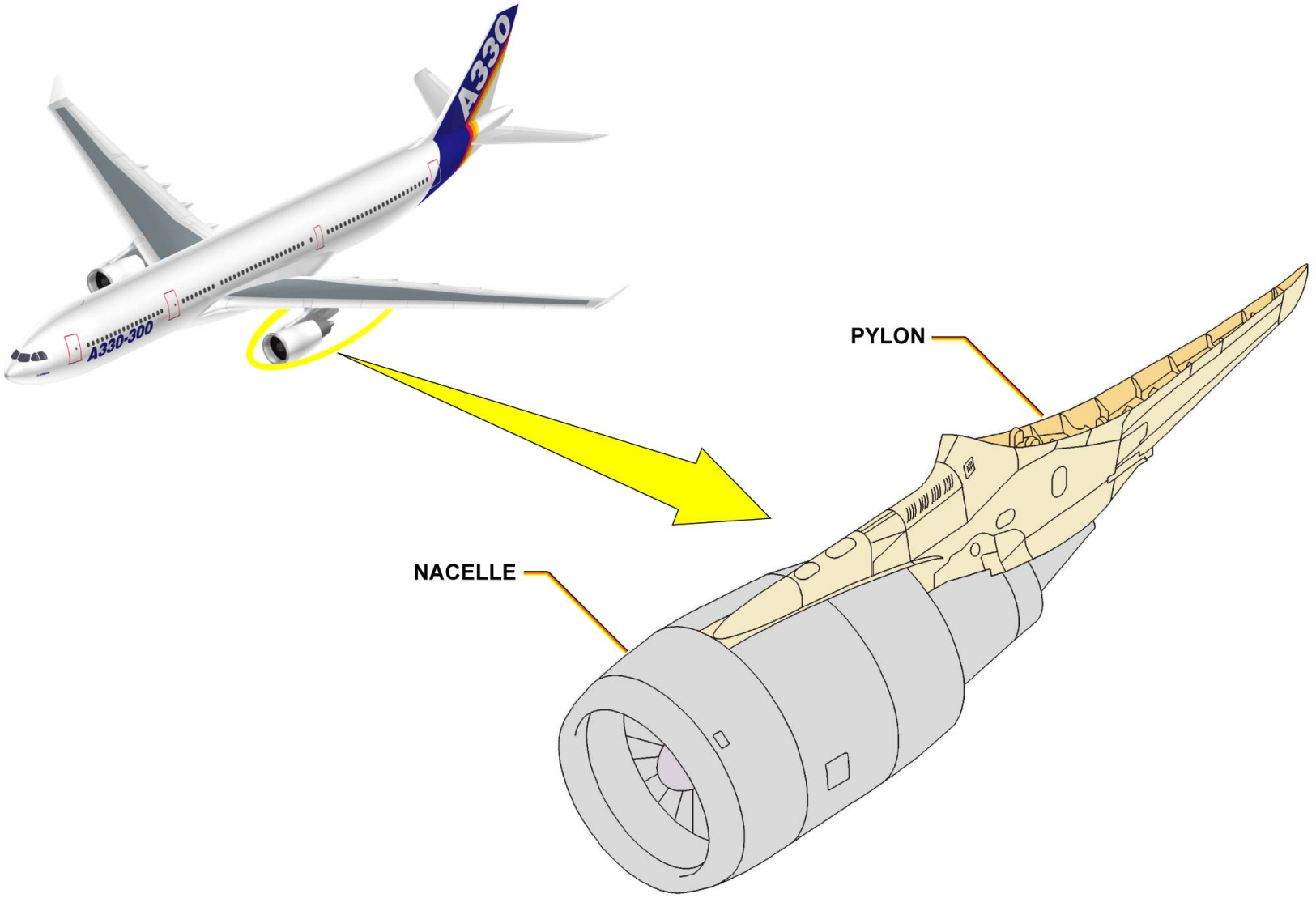
PYLONS/NACELLES D/O (3)

GENERAL

The pylons, installed under each wing:
- support engines,
- transmit the engine thrust to the aircraft,
- enable the routing and the attachment of all the systems connected to the engine (electrical wiring, hydraulic, bleed air and fuel lines).

The nacelle gives the engine an aerodynamic shape.

G4J06491 - G0UT1M0 - FM51DY000000001

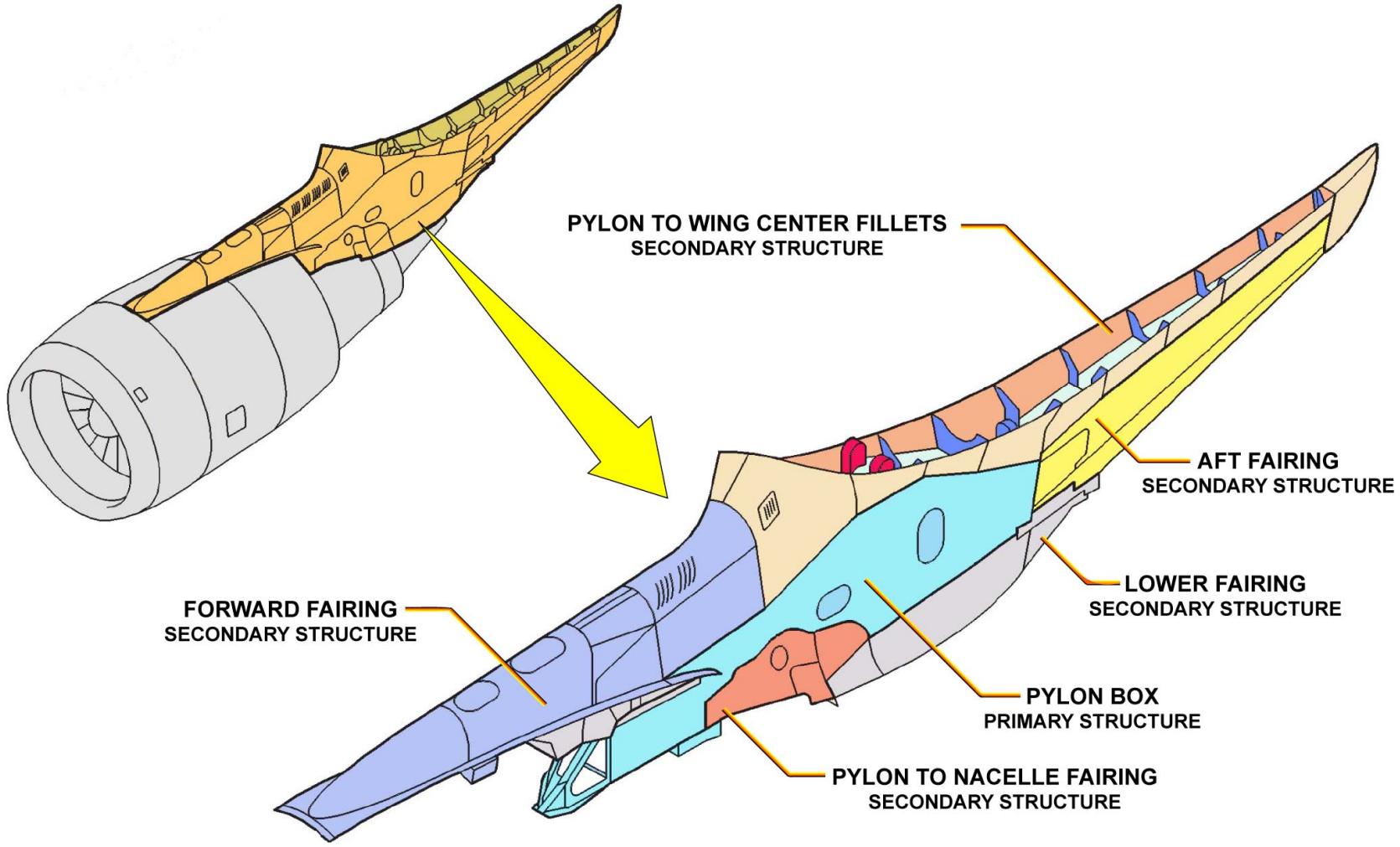


GENERAL

PYLONS/NACELLES D/O (3)

PYLONS - GENERAL ARRANGEMENT

The pylon has:
- a primary structure attached to the wing and supporting the engine,
- a secondary structure, essentially fairings, housing most of the systems and having an aerodynamic profile.



PYLONS - GENERAL ARRANGEMENT

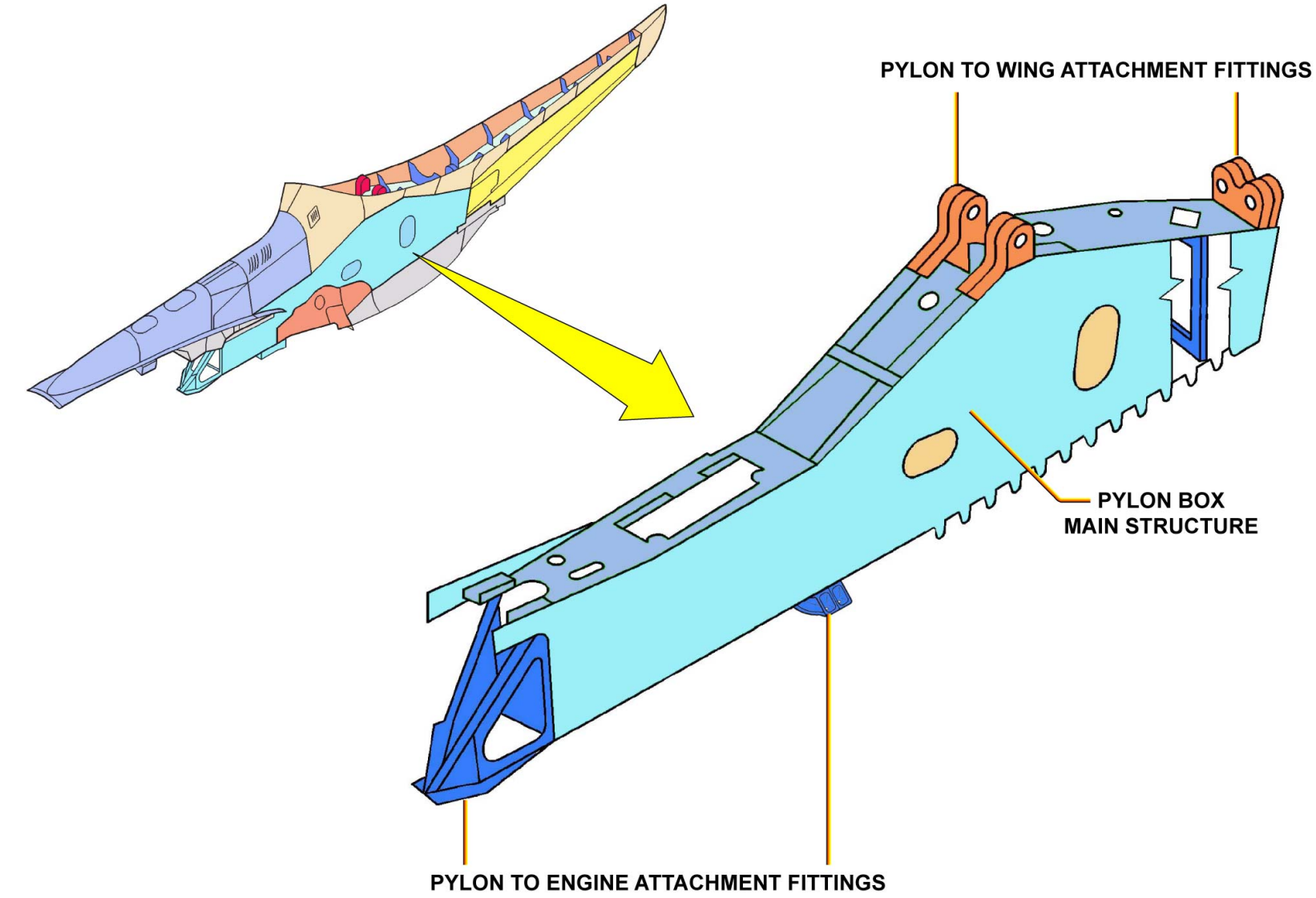
PYLONS/NACELLES D/O (3)

PYLONS PRIMARY STRUCTURE - PYLON BOX

GENERAL ARRANGEMENT

The pylon box is the primary structure. It supports the engine through two points and it is attached to the wing at two points. It transmits the engine thrust to the aircraft.

G4J06491 - G0UT1M0 - FM51DY000000001



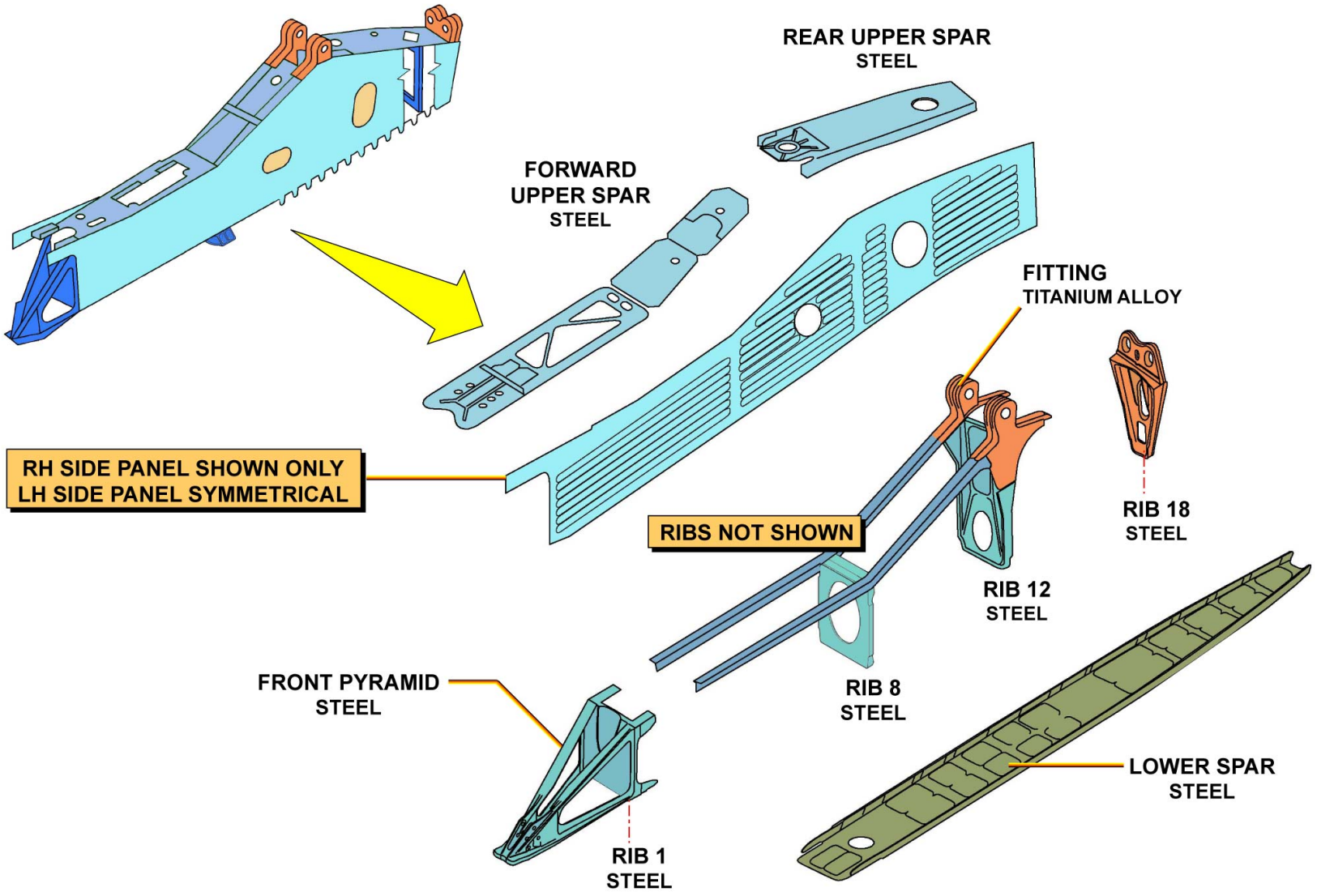
PYLONS PRIMARY STRUCTURE - PYLON BOX - GENERAL ARRANGEMENT

PYLONS/NACELLES D/O (3)

PYLONS PRIMARY STRUCTURE - PYLON BOX (continued)

MAIN ASSEMBLY

The pylon box is composed of ribs, spars and panels, mainly made from steel.



PYLONS PRIMARY STRUCTURE - PYLON BOX - MAIN ASSEMBLY

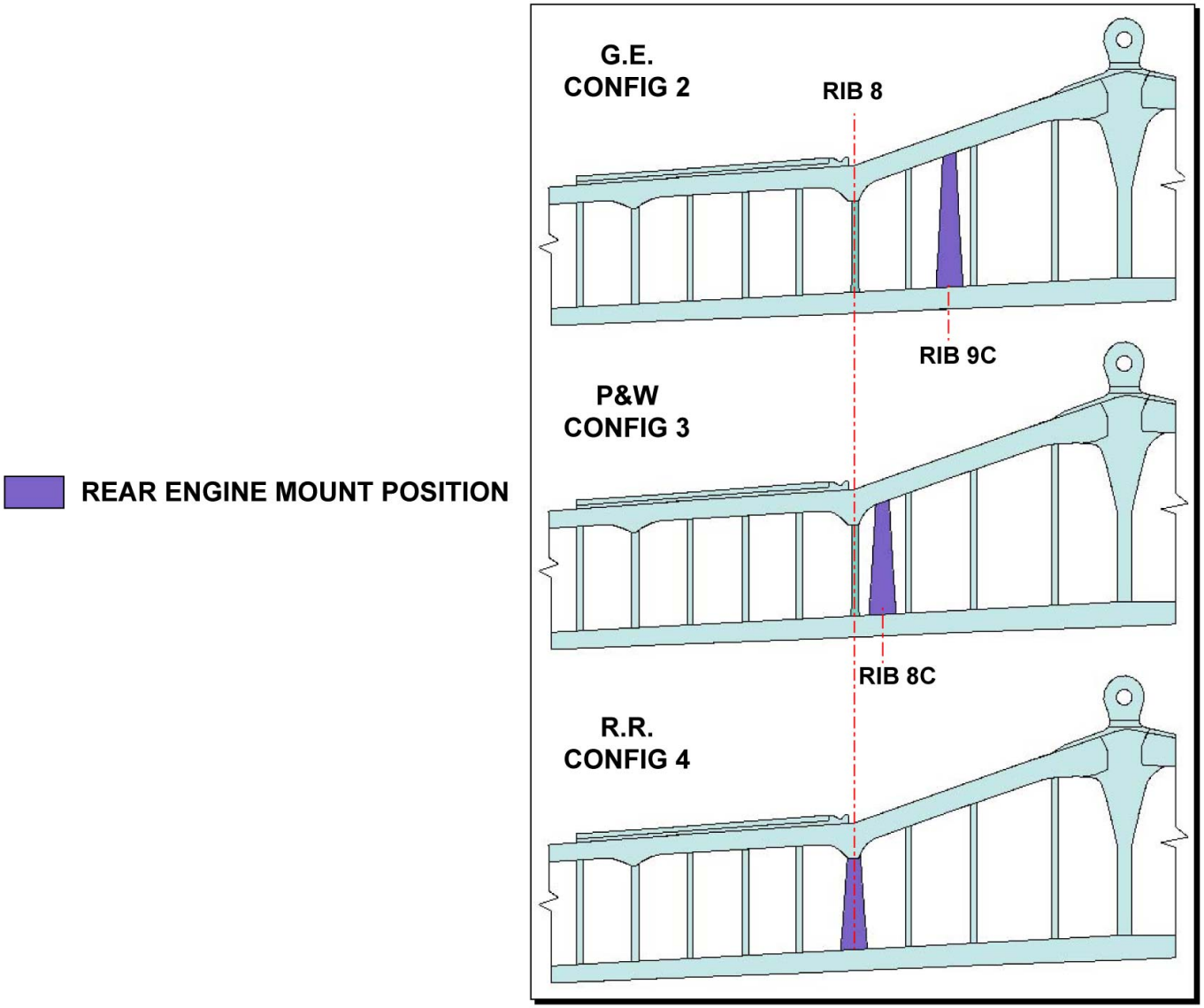
PYLONS/NACELLES D/O (3)

PYLONS PRIMARY STRUCTURE - PYLON BOX (continued)

MAIN ASSEMBLY (DETAILS)

The pylon aft engine attachment beam mating face with the engine aft mounting fitting at:
- Rib 9C (for the General Electrics (G.E.) engine),
- Rib 8C (for the Pratt & Whitney (P&W) engine),
- Rib 8D (for the Rolls Royce (R.R.) engine).

G4J06491 - G0UT1M0 - FM51DY000000001



PYLONS PRIMARY STRUCTURE - PYLON BOX - MAIN ASSEMBLY (DETAILS)

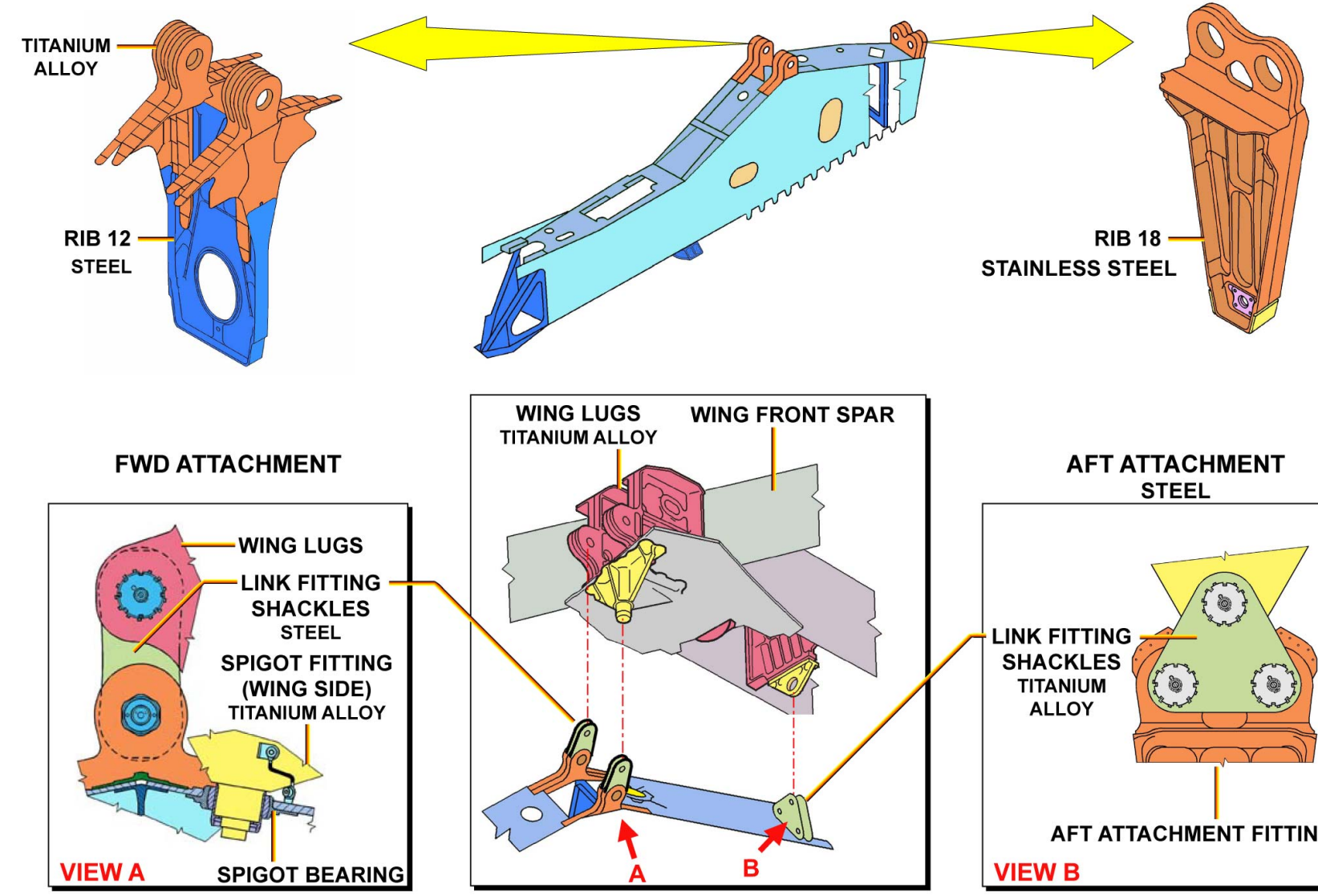
PYLONS/NACELLES D/O (3)

PYLONS PRIMARY STRUCTURE - PYLON BOX (continued)

PYLON TO WING ATTACHMENT

The forward attachment transmits vertical loads. It has inner and outer double lugged fork (made of titanium alloy) attachments at Rib 12, each having four shackles made of high tensile stainless steel. Immediately behind the forward attachment, a spherical bearing transmits the longitudinal and lateral loads to a spigot (thrust fitting, made from titanium, fail safe) bolted through the lower wing skin (engine thrust). The aft attachment is composed of Rib 18 fail safe lugs made of stainless steel, and four shackles made of titanium alloy.

G4J06491 - G0UT1M0 - FM51DY000000001



PYLONS PRIMARY STRUCTURE - PYLON BOX - PYLON TO WING ATTACHMENT

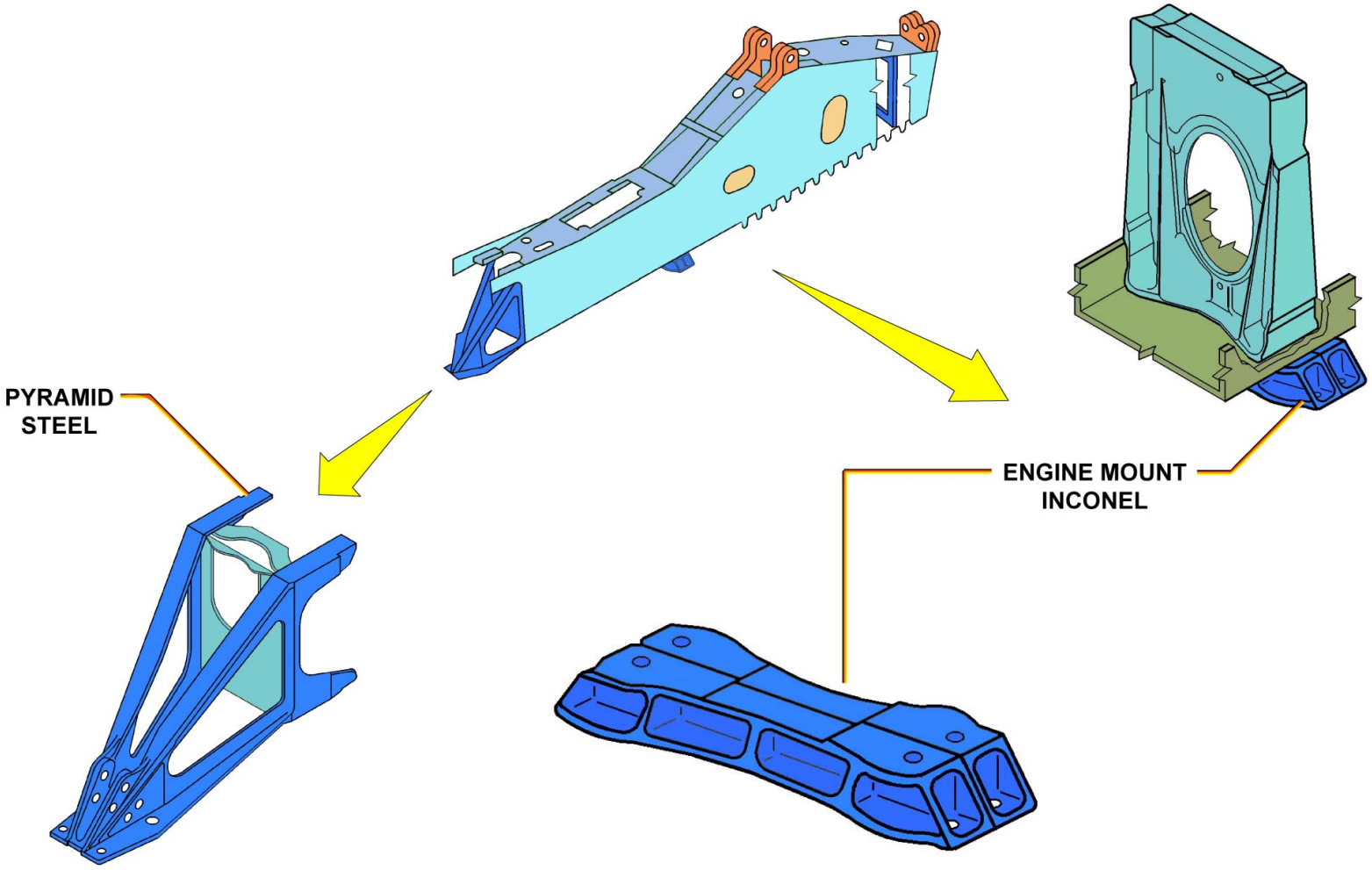
PYLONS/NACELLES D/O (3)

PYLONS PRIMARY STRUCTURE - PYLON BOX (continued)

ENGINE TO PYLON ATTACHMENT

The engine to pylon attachment has a front pyramid made of steel (attached to Rib 1) and a rear mount made of inconel. The front pyramid transmits the engine thrust, side loads and vertical loads. The rear attachment (engine mount) transmits vertical loads, side loads and roll moment.

G4J06491 - G0UT1M0 - FM51DY000000001



PYLONS PRIMARY STRUCTURE - PYLON BOX - ENGINE TO PYLON ATTACHMENT

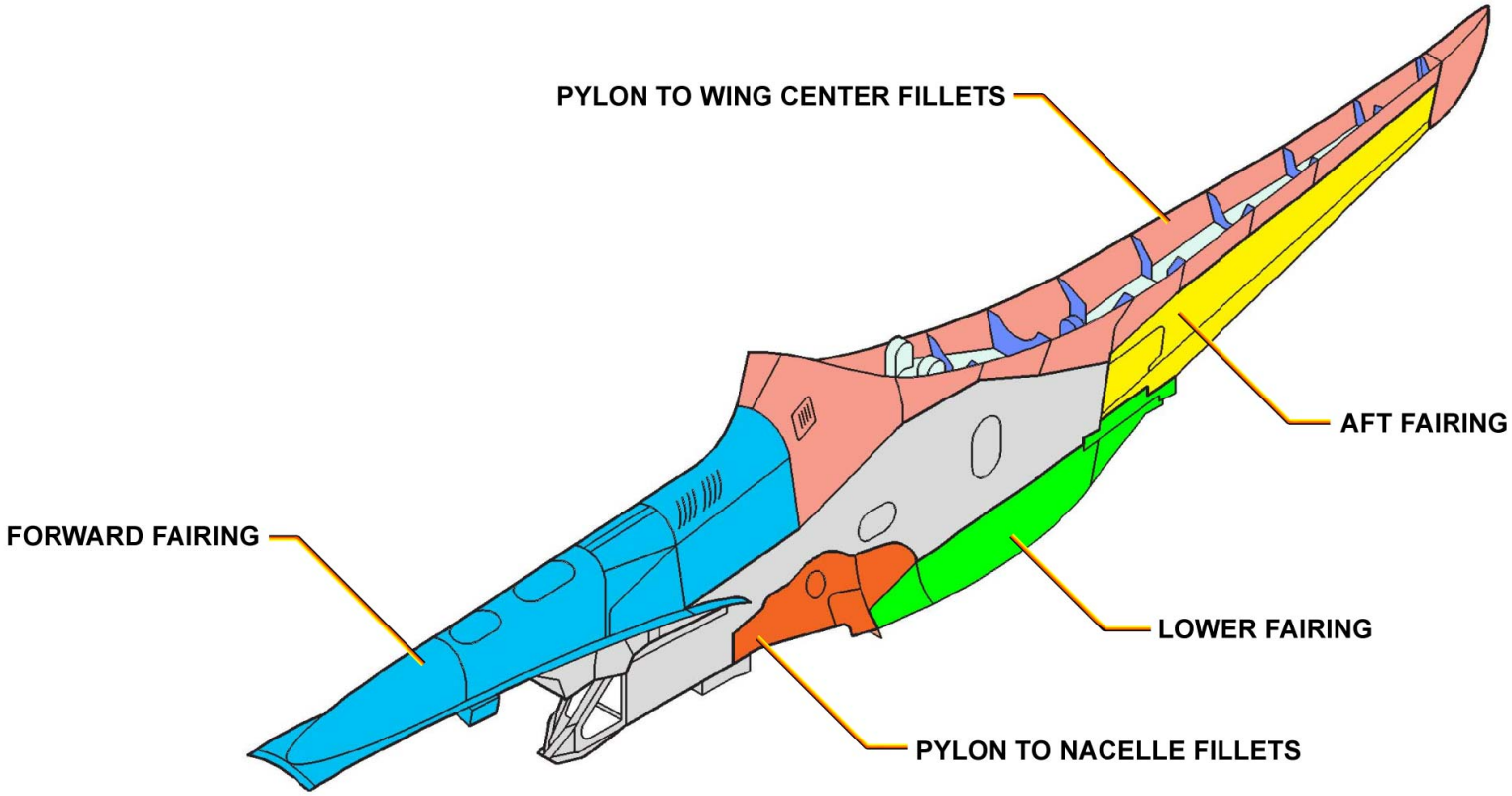
PYLONS/NACELLES D/O (3)

PYLONS SECONDARY STRUCTURE

GENERAL ARRANGEMENT

The secondary structure has:
- the forward fairing (cantilever),
- the pylon-to-wing center fillets,
- the aft fairing,
- the lower fairing,
- the pylon to nacelle fillets.

G4J06491 - G0UT1M0 - FM51DY000000001



PYLONS SECONDARY STRUCTURE - GENERAL ARRANGEMENT

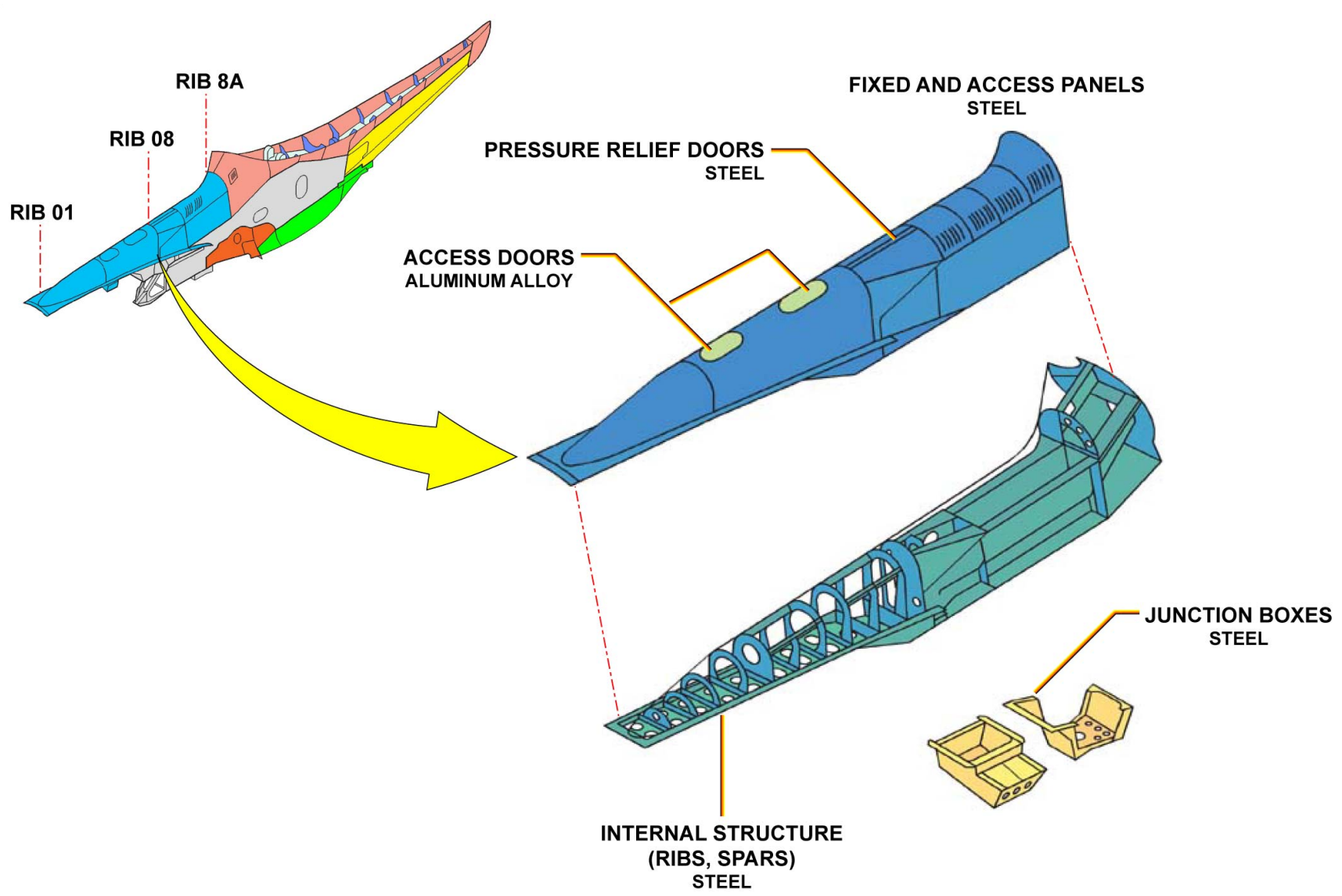
PYLONS/NACELLES D/O (3)

PYLONS SECONDARY STRUCTURE (continued)

FORWARD FAIRING

The forward fairing can be divided into two sections; the cantilever structure between Rib 01 and Rib 08, and the structure between Rib 08 and Rib 8A. The cantilever structure gives an aerodynamic contour between the engine nose cowl and the pylon main structure. It enables the electric cables and the hydraulic pipes to be routed to the engine. The structure between Rib 08 and Rib 8A gives an aerodynamic contour between the cantilever structure and the wing leading edge, and enables the routing of various system lines and cables. It includes in particular two pressure relief doors, which are designed to open in case of hot bleed air duct bursting. The structure is mainly made of steel.

G4J06491 - G0UT1M0 - FM51DY000000001



PYLONS SECONDARY STRUCTURE - FORWARD FAIRING

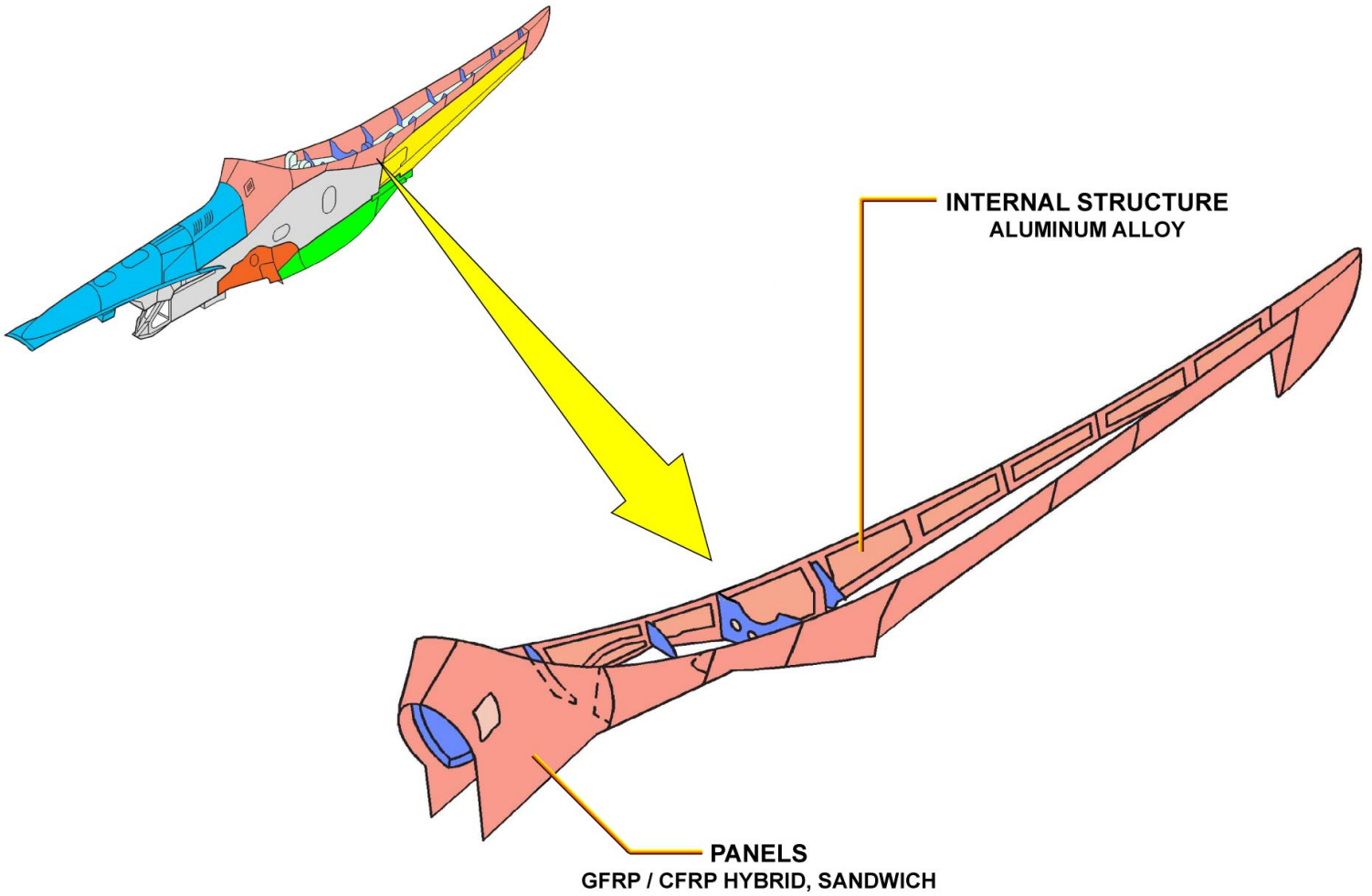
G4J06491 - G0UT1M0 - FM51DY000000001

PYLONS/NACELLES D/O (3)

PYLONS SECONDARY STRUCTURE (continued)

PYLON TO WING CENTER FILLETS

The pylon-to-wing center fillets give an aerodynamic contour between the pylon main frame and the wing lower surface.
The pylon-to-wing center fillets have aluminum alloy ribs supporting panels made of sandwich composite material (carbon/glass hybrid skins and honeycomb core).



GFRP : Glass Fiber Reinforced Plastic

CFRP : Carbon Fiber Reinforced Plastic

PYLONS SECONDARY STRUCTURE - PYLON TO WING CENTER FILLETS

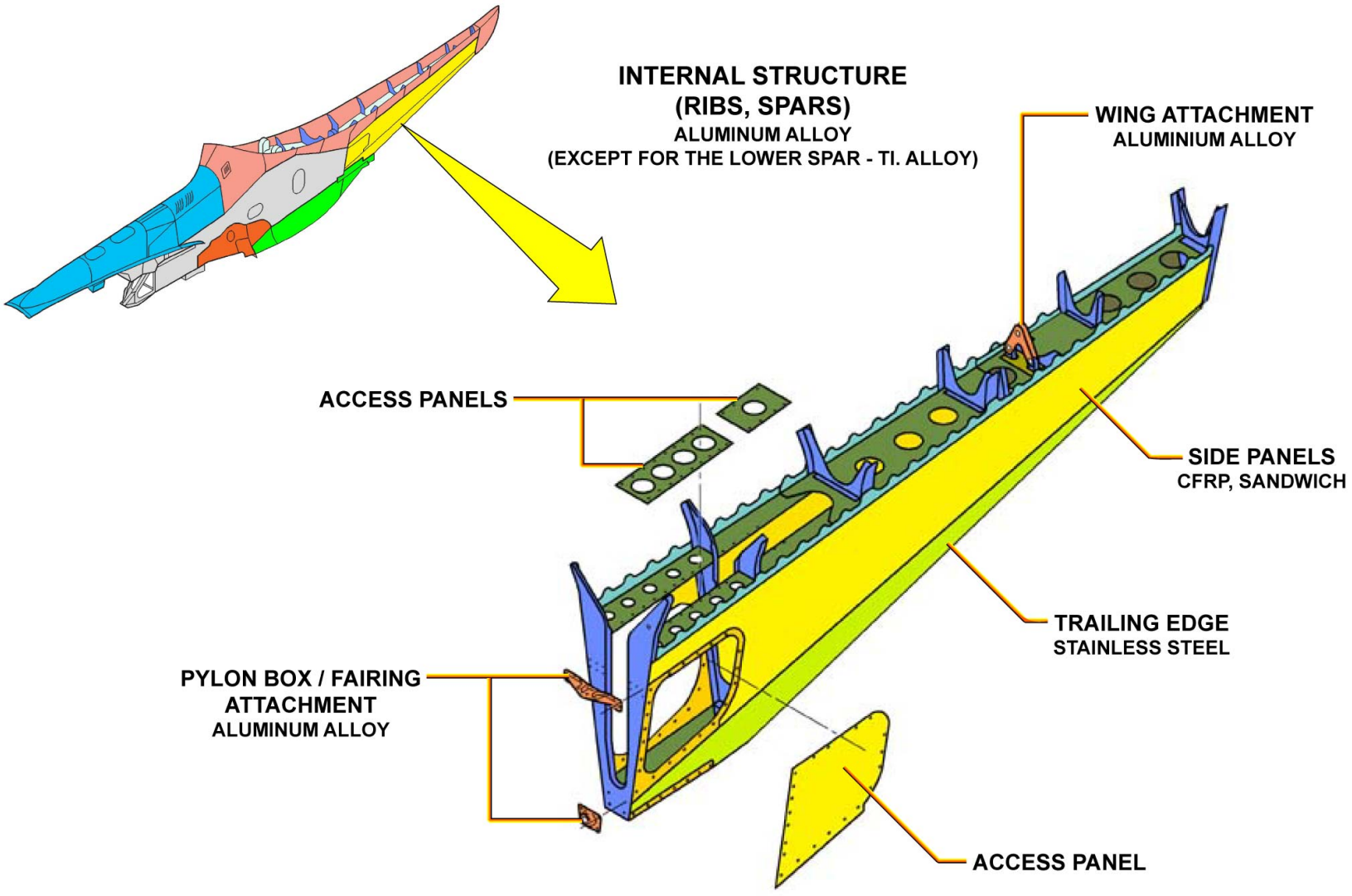
PYLONS/NACELLES D/O (3)

PYLONS SECONDARY STRUCTURE (continued)

AFT FAIRING

The aft fairing is located aft of the pylon box. It is attached to the pylon box and to the wing lower surface, and improves the aerodynamic contour. The side panels are made of carbon sandwich construction with honeycomb core, and are supported by an aluminum alloy structure.
The green hydraulic lines are routed inside this structure.

G4J06491 - G0UT1M0 - FM51DY000000001



CFRP : Carbon Fiber Reinforced Plastic

PYLONS SECONDARY STRUCTURE - AFT FAIRING

G4J06491 - G0UT1M0 - FM51DY000000001

PYLONS/NACELLES D/O (3)

PYLONS SECONDARY STRUCTURE (continued)

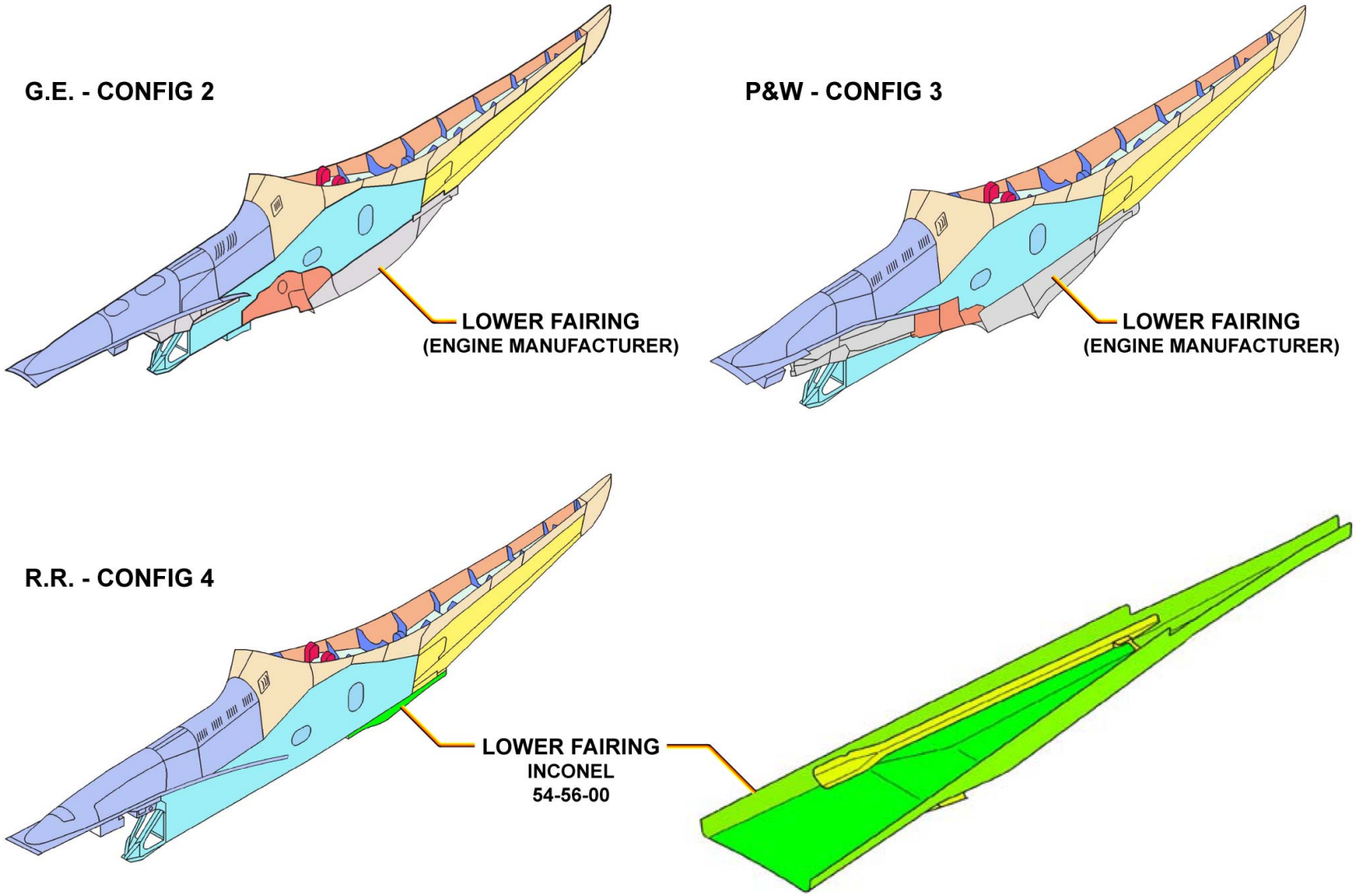
LOWER FAIRING

A fairing located under the pylon box (lower fairing) ensures the continuity of the aerodynamic profile between the pylon box and the engine nozzle. Its function is:
- to provide a thermal protection to the pylon from the engine exhaust gases,
- to smooth out protrusions with minimal aerodynamic drag changes,
- to prevent leakage of fan exhaust gazes into the fairing interior.

The lower fairing is made of inconel 718.

NOTE: The G.E. (config. 2) and P&W (config. 3) lower fairings are under the manufacturer responsibility; only the R.R. lower fairing is under the Airbus responsibility.

G4J06491 - G0UT1M0 - FM51DY000000001



PYLONS SECONDARY STRUCTURE - LOWER FAIRING

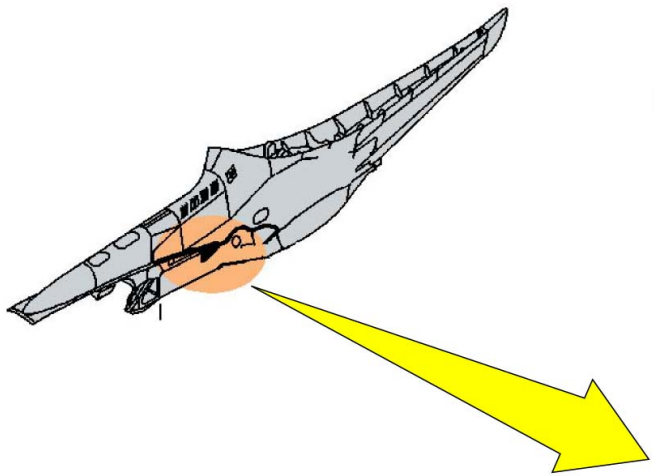
PYLONS/NACELLES D/O (3)

PYLONS SECONDARY STRUCTURE (continued)

PYLON TO NACELLE FILLETS

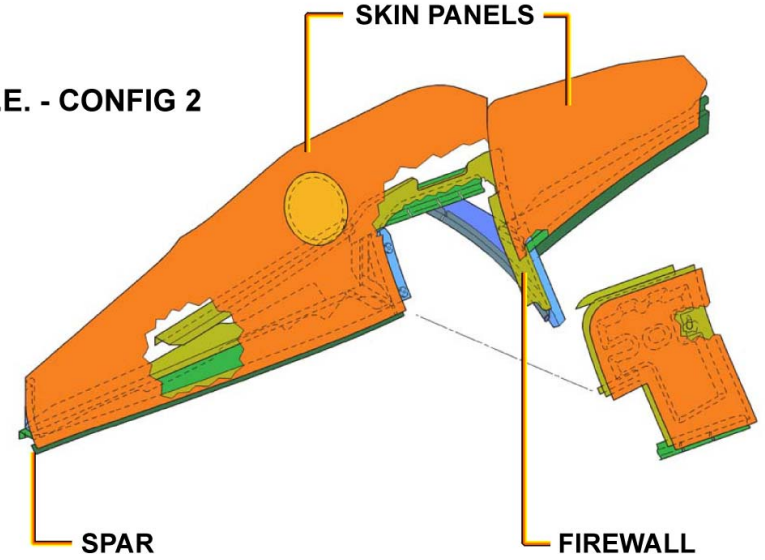
The pylon-to-engine center fillets give the aerodynamic profile between the pylon box and the engine. The pylon-to-engine center fillets are made of steel parts.

G4J06491 - G0UT1M0 - FM51DY000000001

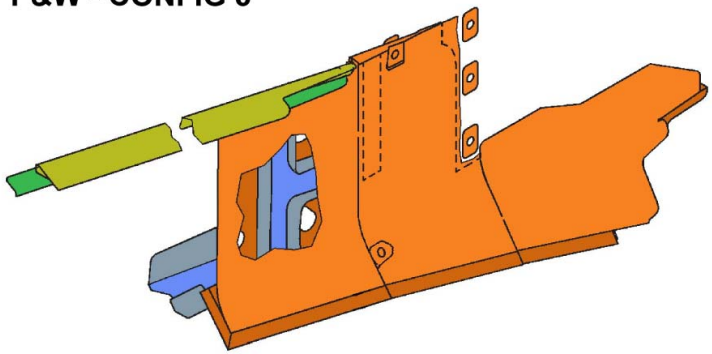


STRUCTURE MAINLY MADE OF STEEL

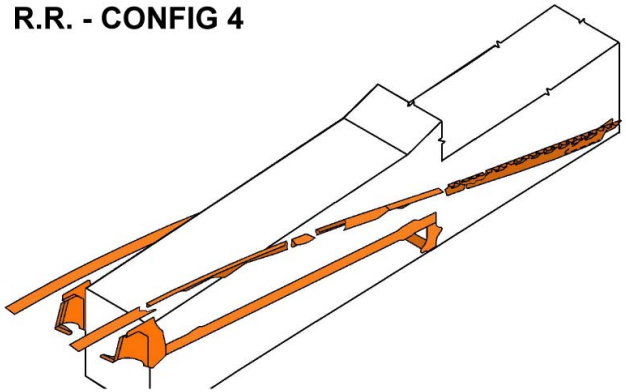
G.E. - CONFIG 2



P&W - CONFIG 3



R.R. - CONFIG 4



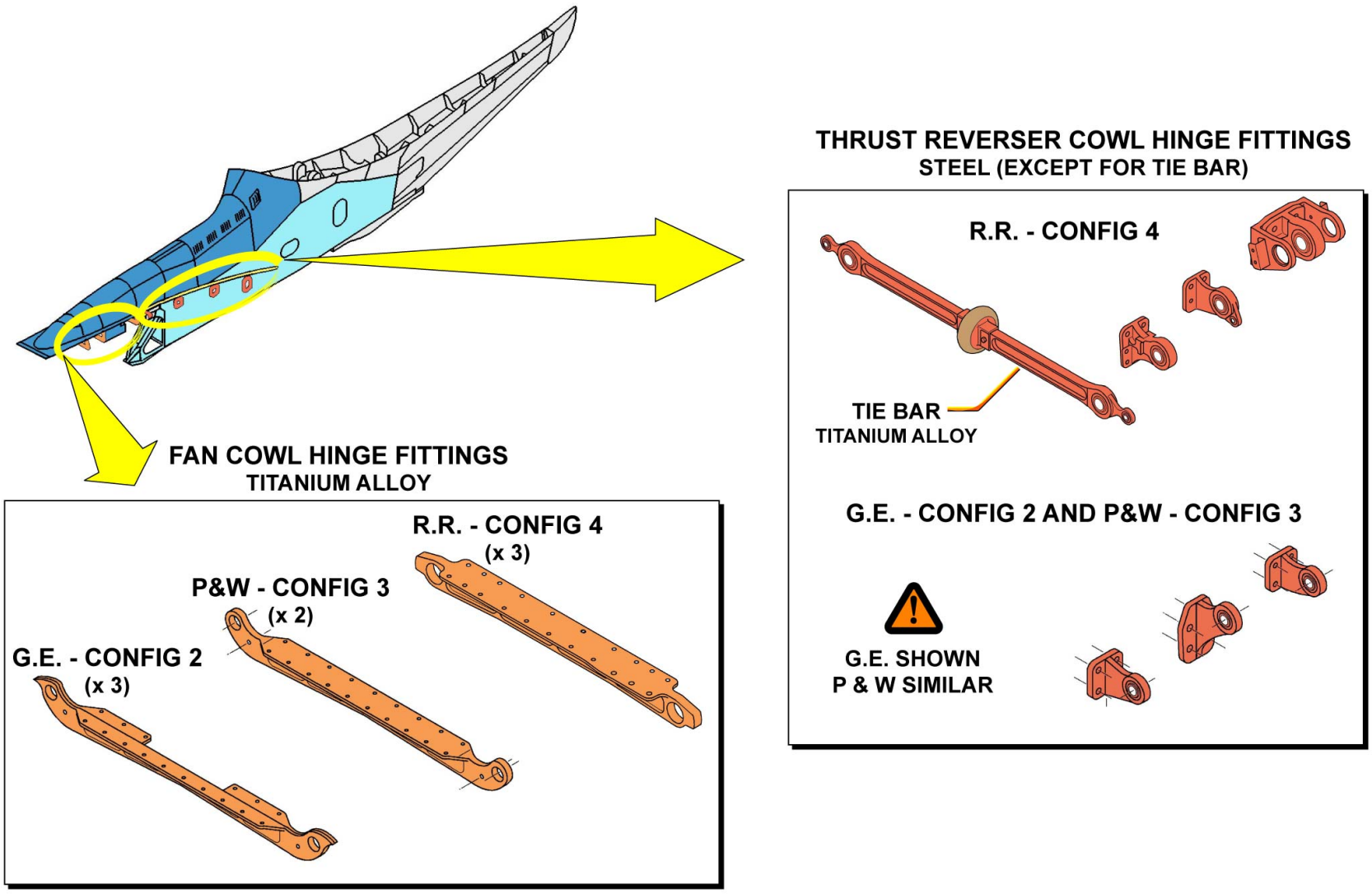
PYLONS SECONDARY STRUCTURE - PYLON TO NACELLE FILLETS

PYLONS/NACELLES D/O (3)

PYLON TO NACELLE JUNCTION

The pylon-to-nacelle junction has two attachments:
- fan cowl door attachments: the hinge fittings of the fan cowl doors are located at Rib 03, Rib 04 and Rib 06.They are made of titanium and installed on the forward secondary structure,
- thrust reverser door attachments: The hinge fittings of the thrust reverser doors are located at Rib 1, Rib 2, Rib 4 and Rib 6. They are made of steel and installed on the primary structure (pylon box). An another hinge (tie-bar) go through the secondary structure and is located between Rib 7B and Rib 08. It is made of titanium alloy.

G4J06491 - G0UT1M0 - FM51DY000000001



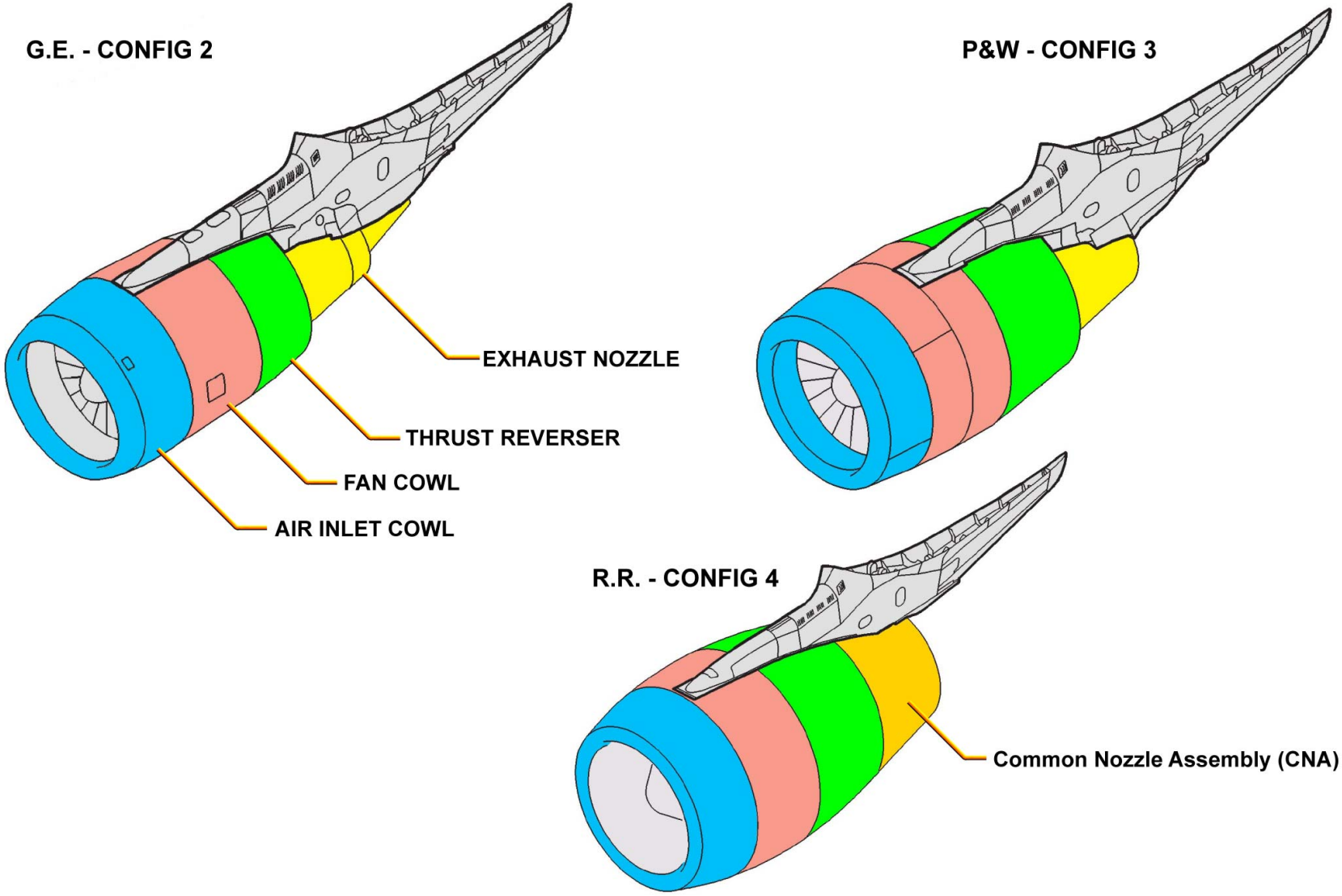
PYLON TO NACELLE JUNCTION

PYLONS/NACELLES D/O (3)

NACELLES - GENERAL

The nacelle gives an aerodynamic shape to the engine. The nacelle is an assembly of:
- air inlet cowl (or air intake cowl),
- fan cowls,
- thrust reverser (TR),
- core cowls,
- exhaust nozzle.

The nacelles are under the responsibility of the engine manufacturers: R.R., G.E. and P&W.

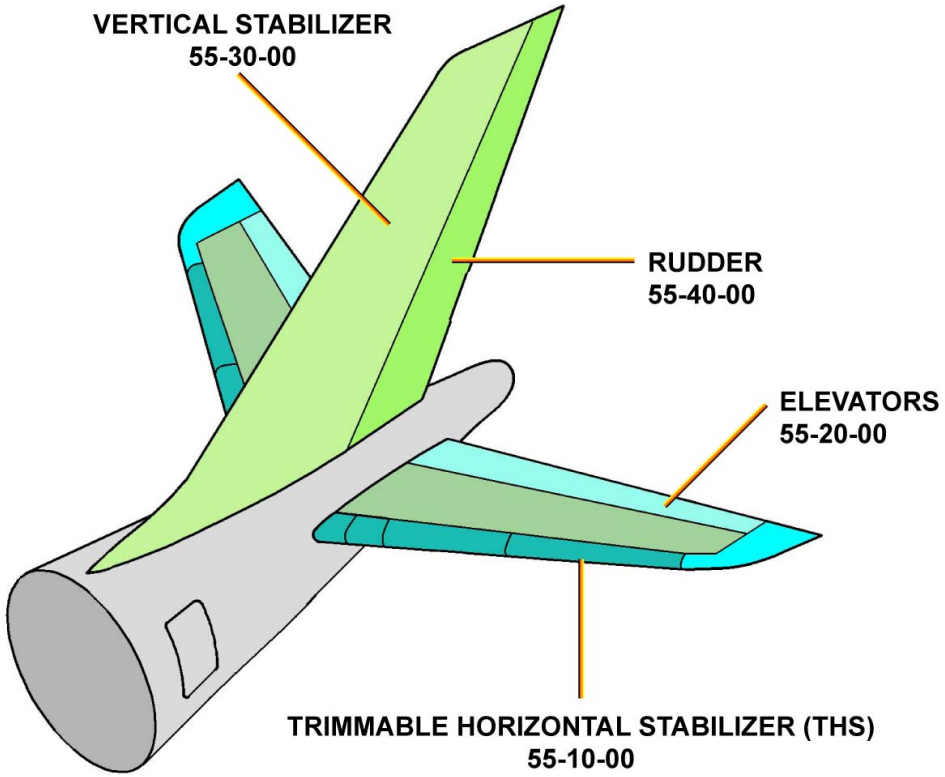


NACELLES - GENERAL

STABILIZERS D/O (3)

STABILIZERS - GENERAL ARRANGEMENT

The stabilizers have: the Trimmable Horizontal Stabilizer (THS), the elevators, the vertical stabilizer and the rudder. The horizontal stabilizer and the rudder are trimmable, the elevators give pitch control to the A/C, the rudder is one of the primary controls of the A/C.



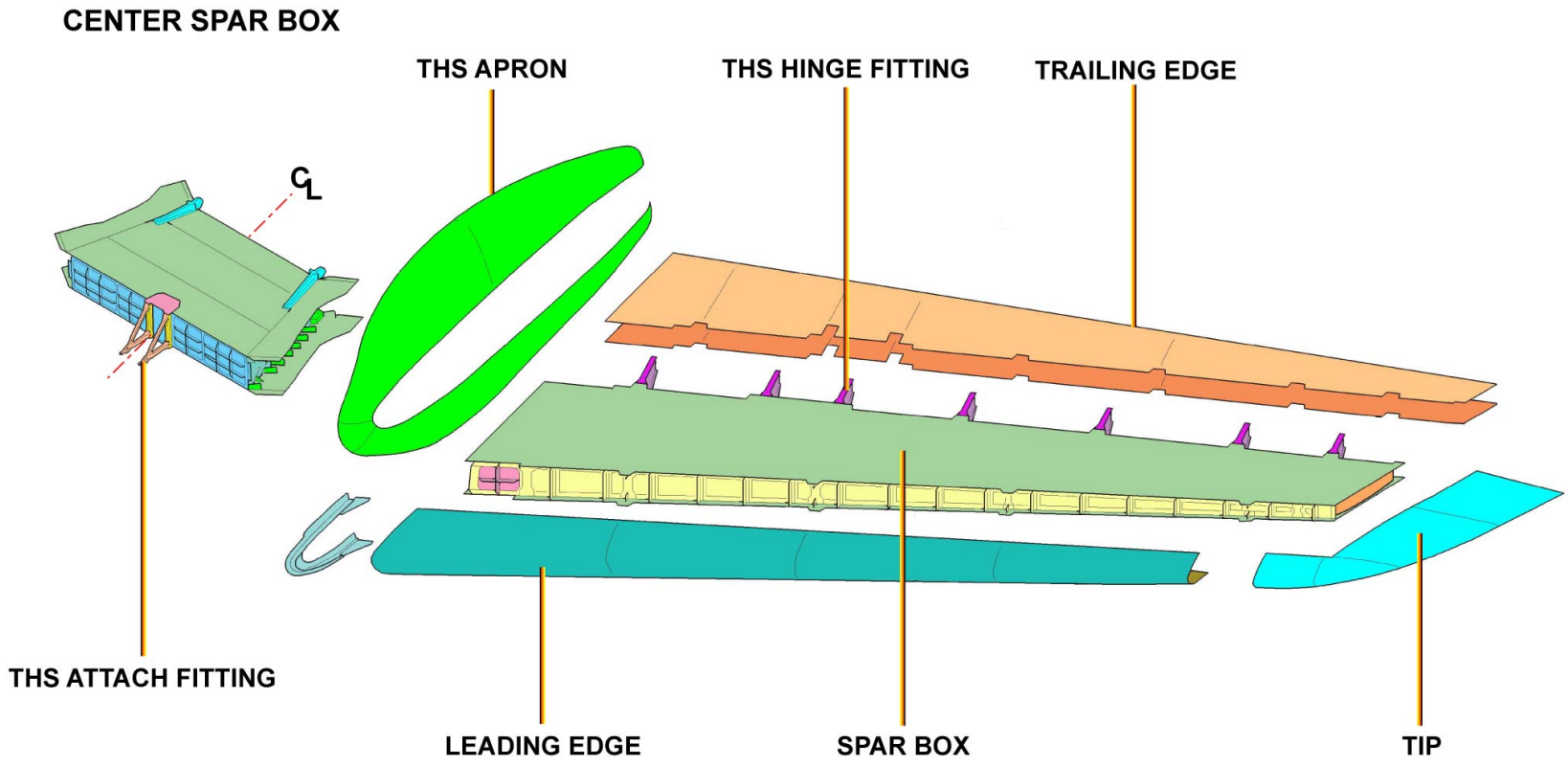
STABILIZERS - GENERAL ARRANGEMENT

STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS)

GENERAL ARRANGEMENT

The Trimmable Horizontal Stabilizer (THS) main structure includes: the spar boxes (Center, LH side and RH side), the leading edge, the trailing edge and the attachment fittings. The spar boxes are the primary structure of the THS and supports all other components.



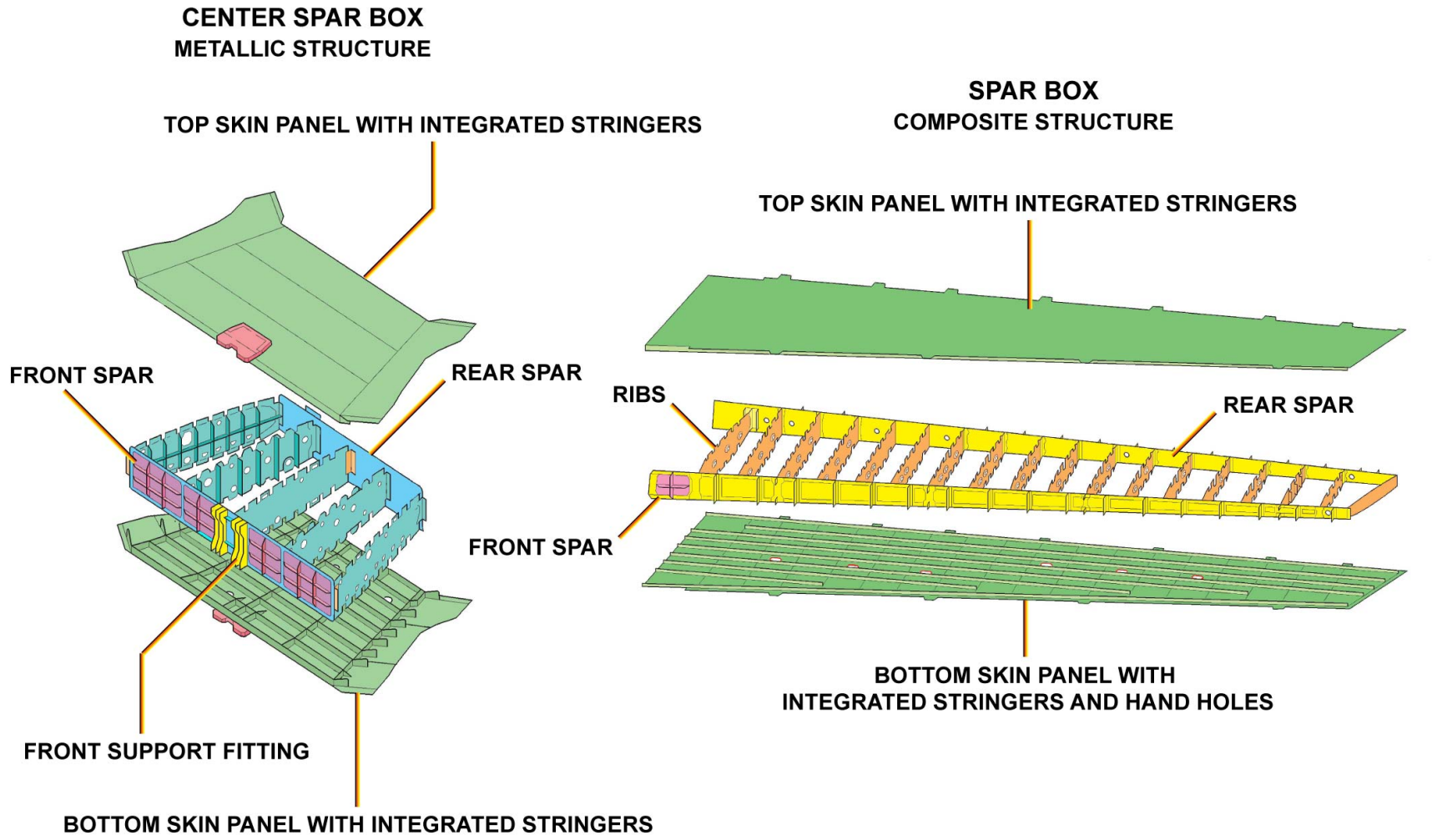
TRIMMABLE HORIZONTAL STABILIZER (THS) - GENERAL ARRANGEMENT

STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

SPAR BOXES

The complete spar box assembly has the LH and RH side boxes and the center spar box. The center box joins the LH and RH side spar boxes to make one unit. Each spar box has a top and bottom skin panels, a front spar, a rear spar and nineteen ribs (from Rib 3 to Rib 21). The LH and the RH spar boxes are made of Carbon Fiber Reinforced Plastic (CFRP). The center box is made of aluminum-machined parts.



TRIMMABLE HORIZONTAL STABILIZER (THS) - SPAR BOXES

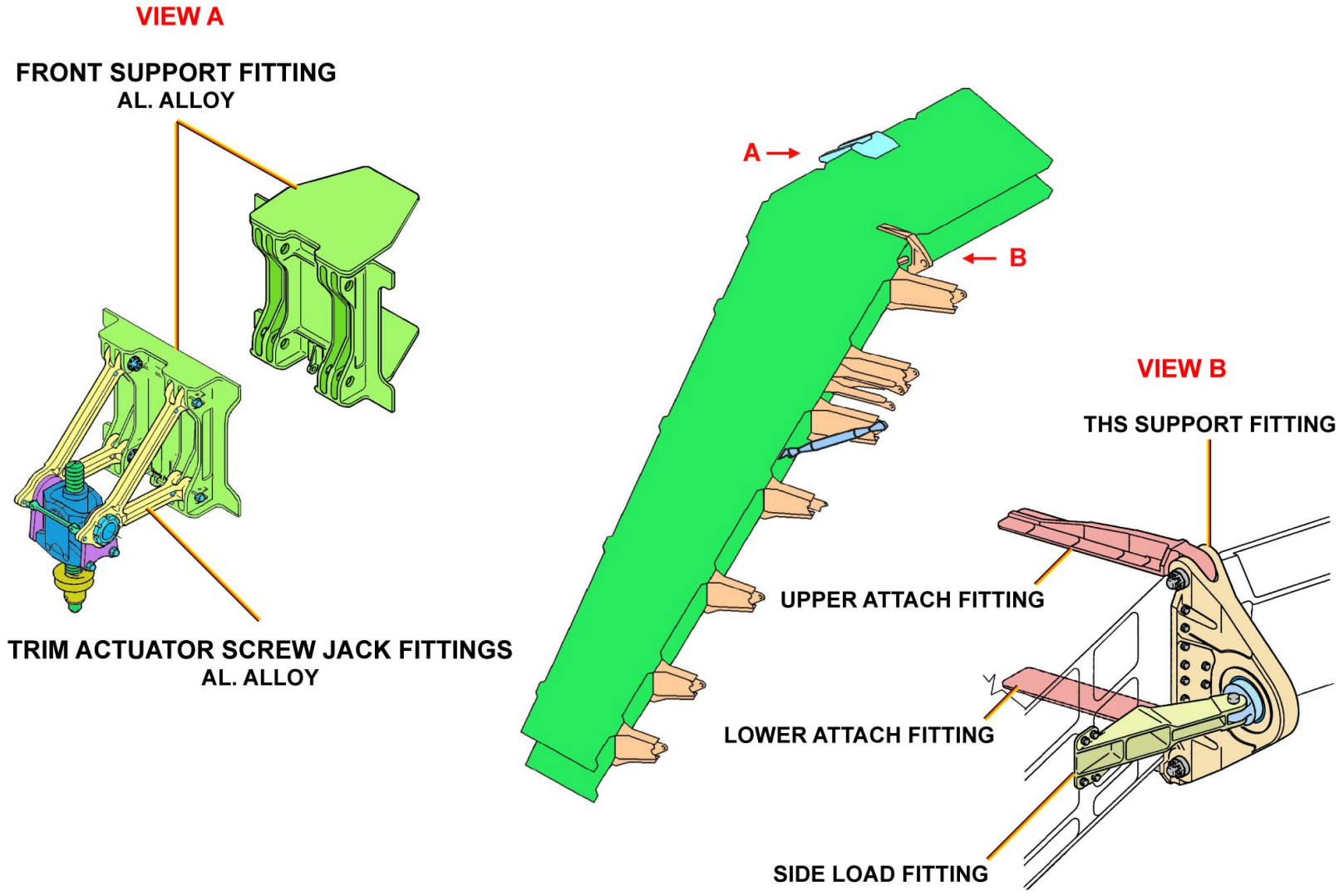
STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

MAIN SUPPORT FITTINGS

The main support fittings are located on the center spar box:
- on the front spar: the THS actuator attach fitting connects the THS to the trim actuator,
- on the rear spar: the THS support fitting (two pivot points).

All fittings are made of aluminum alloy.



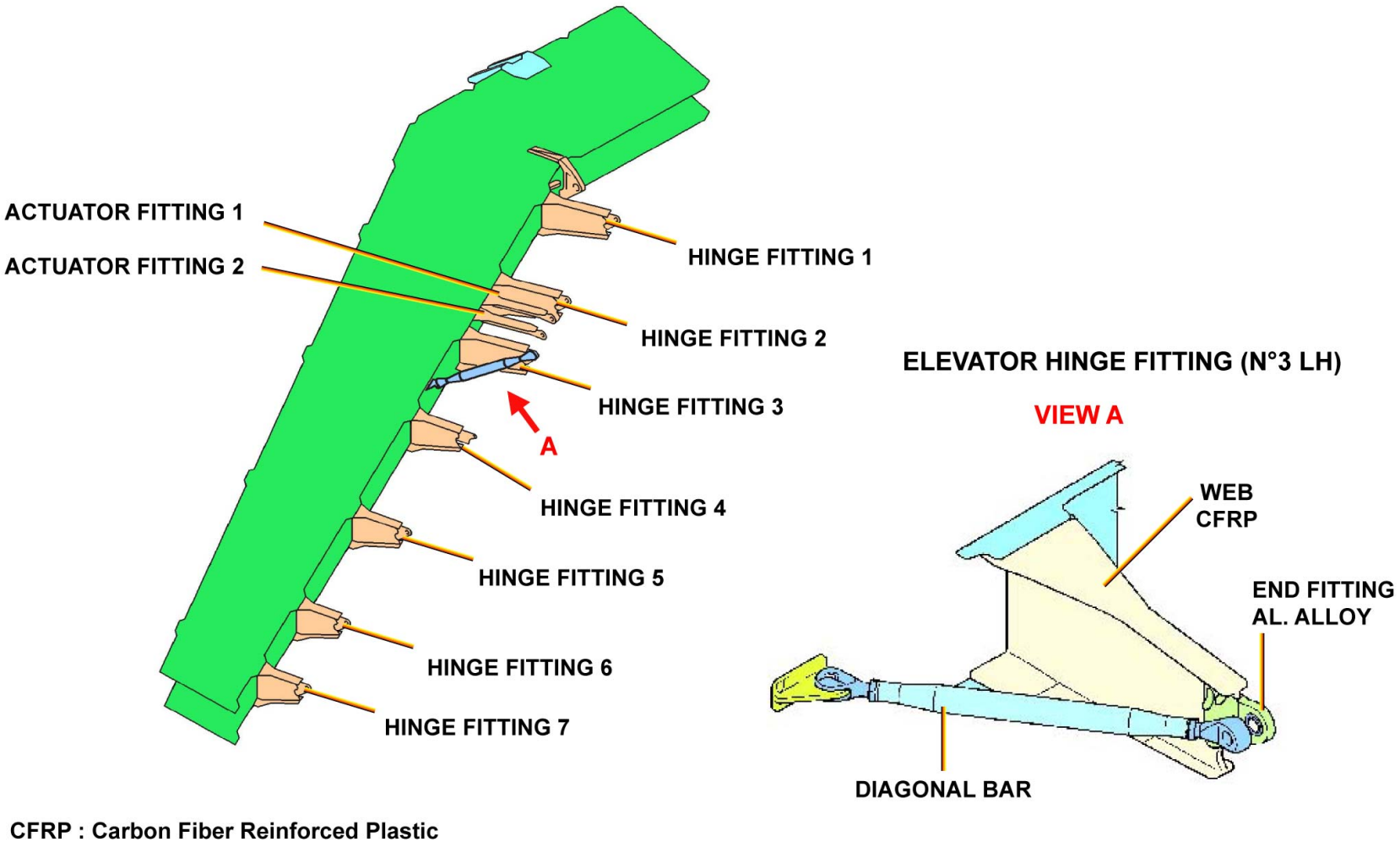
TRIMMABLE HORIZONTAL STABILIZER (THS) - MAIN SUPPORT FITTINGS

STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

ELEVATOR ATTACHMENT FITTINGS

Each rear spar has seven elevator hinge arms, a diagonal strut to hold the elevators and two fittings for the attachment of the elevator servo control actuators.



TRIMMABLE HORIZONTAL STABILIZER (THS) - ELEVATOR ATTACHMENT FITTINGS

STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

LEADING EDGE

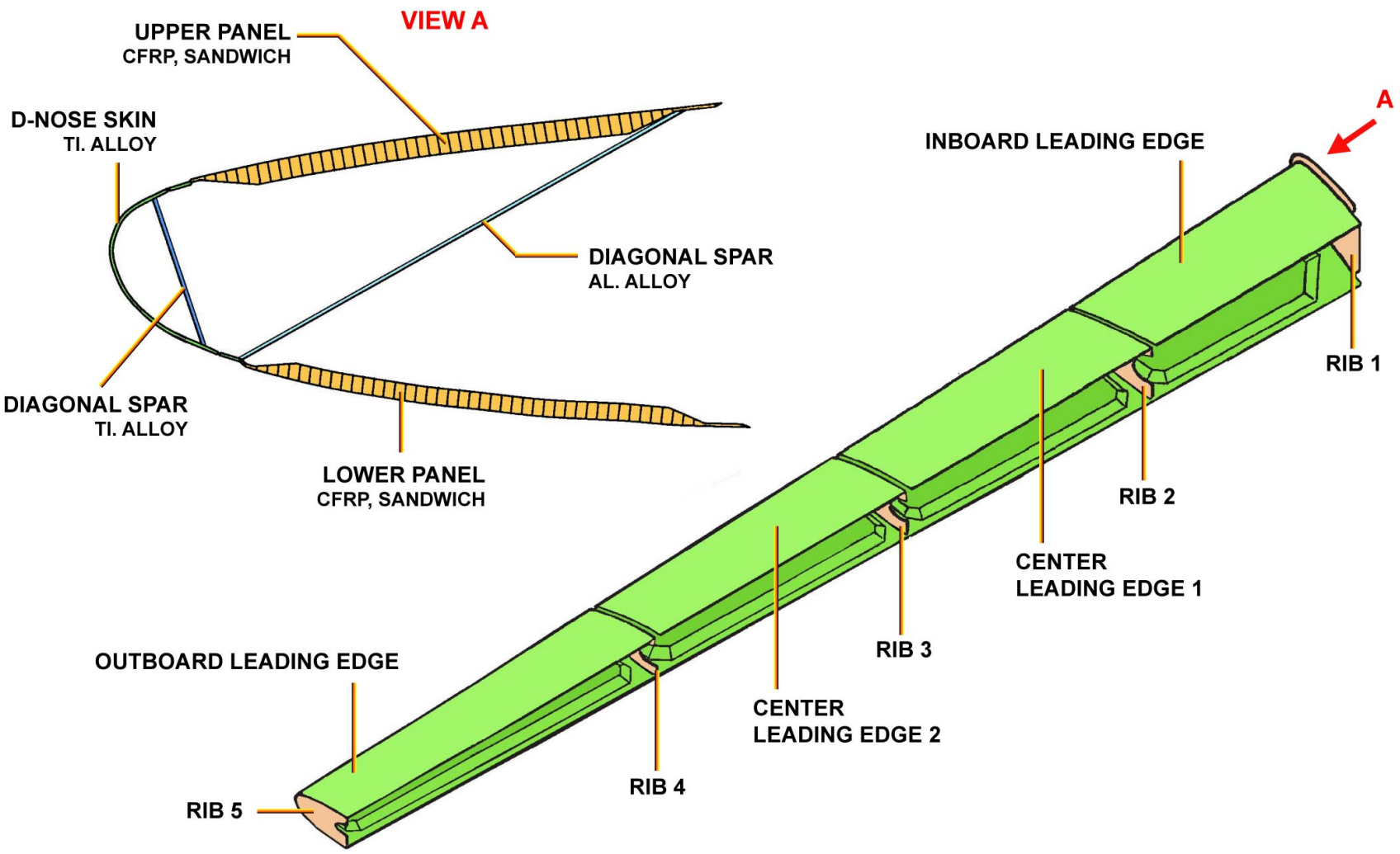
The leading edge has an aerodynamic shape at the front of the THS. On each side of the THS centerline, the THS leading edge includes: five Carbon Fiber Reinforced Plastic (CFRP) leading edge ribs, one outboard-leading edge section, two center-leading edge sections and one inboard-leading edge section. Each leading edge rib has anchor nuts for the installation of the leading edge sections. Each leading edge section is a full component, which includes an upper and lower panels, and a leading edge nose plate.

To give added strength to the leading edge panels a diagonal spar made of aluminum alloy is riveted to their internal structure.

To give added strength to the nose plate ("D-nose"), a diagonal spar made of titanium alloy is riveted to its internal structure.

The upper and lower leading edge panels are made of CFRP sandwich construction.

G4J06491 - G0UT1M0 - FM51DJ000000001



TRIMMABLE HORIZONTAL STABILIZER (THS) - LEADING EDGE

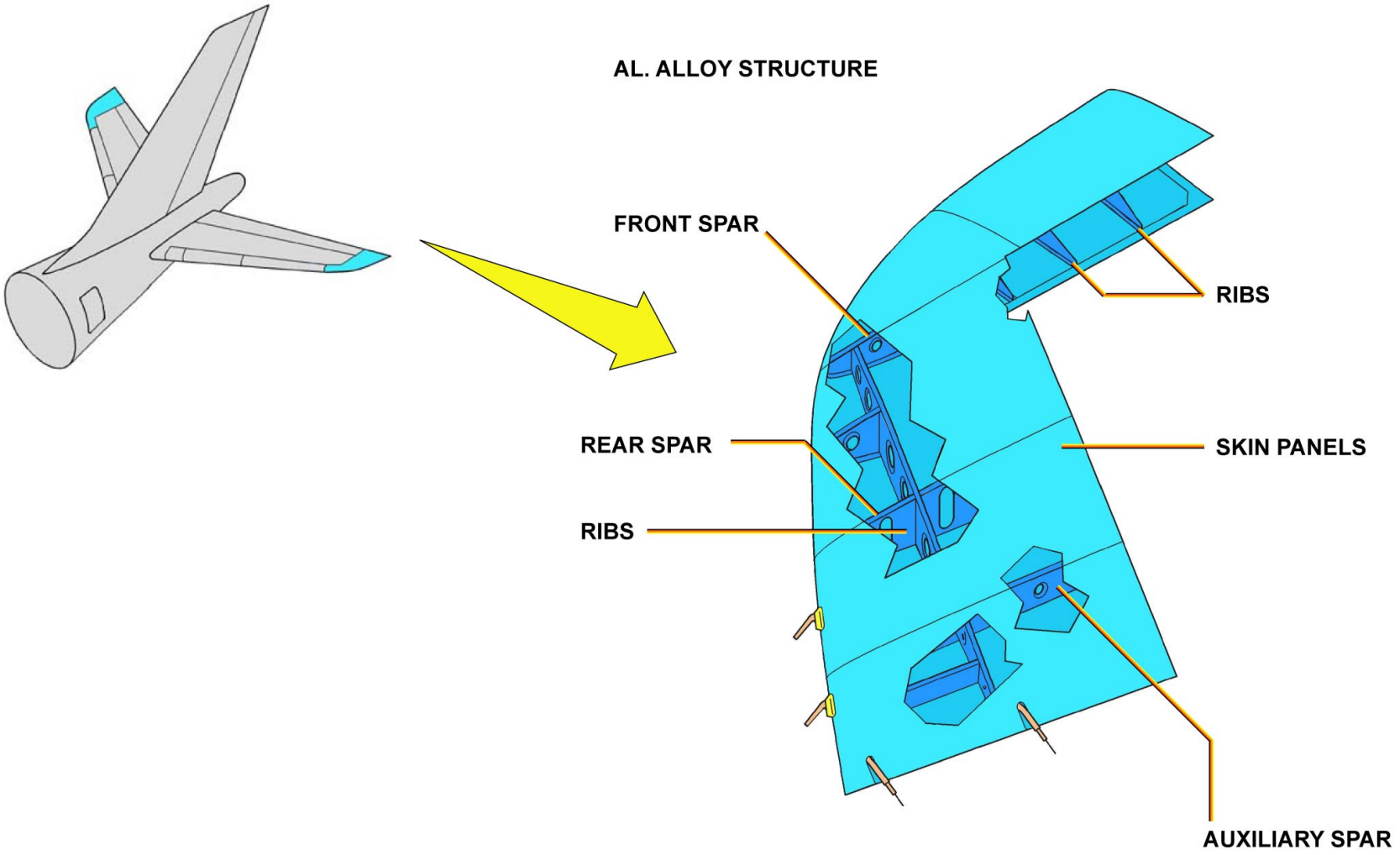
G4J06491 - G0UT1M0 - FM51DJ000000001

STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

TIP

The THS tips complete the aerodynamic shape of the THS leading edge. The skin panels, spars and ribs are made of aluminum alloy. Four static dischargers are bolted to the THS leading edge and spar boxes.



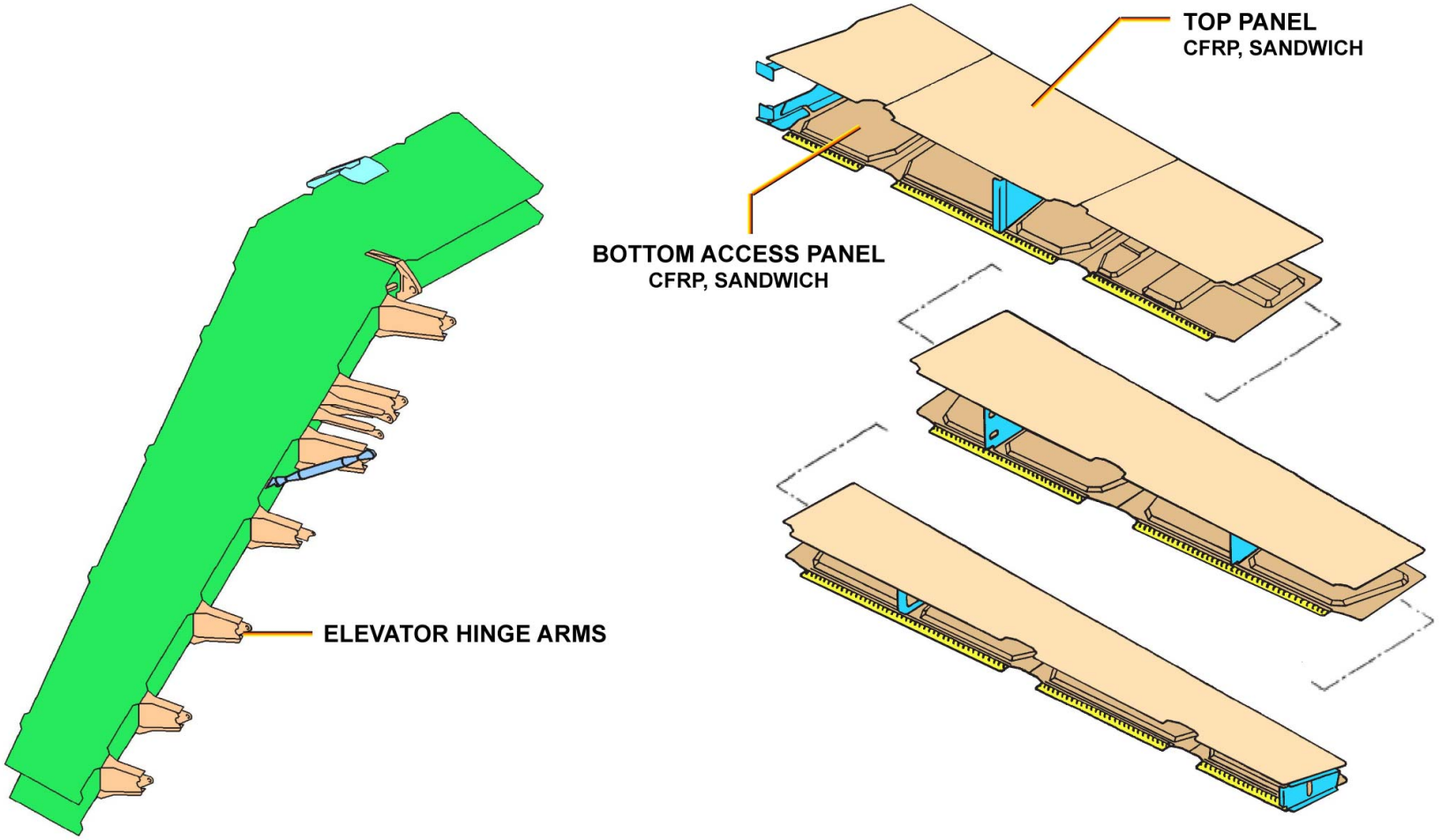
TRIMMABLE HORIZONTAL STABILIZER (THS) - TIP

STABILIZERS D/O (3)

TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

TRAILING EDGE

The trailing edge has an aerodynamic surface between the THS spar box and the elevator. On each side of the THS, the trailing edge panels (five top panels and seven bottom access panels) are supported by six intermediate ribs, and by seven hinge arm supports. The panels are made of CFRP sandwich construction. The panel assemblies and the access panels are sealed with rubber seal strip to prevent ingress of contaminants.



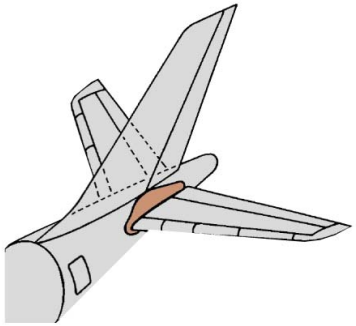
TRIMMABLE HORIZONTAL STABILIZER (THS) - TRAILING EDGE

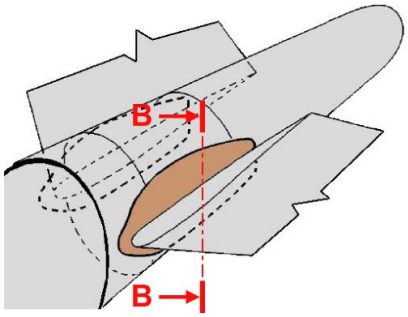
STABILIZERS D/O (3)

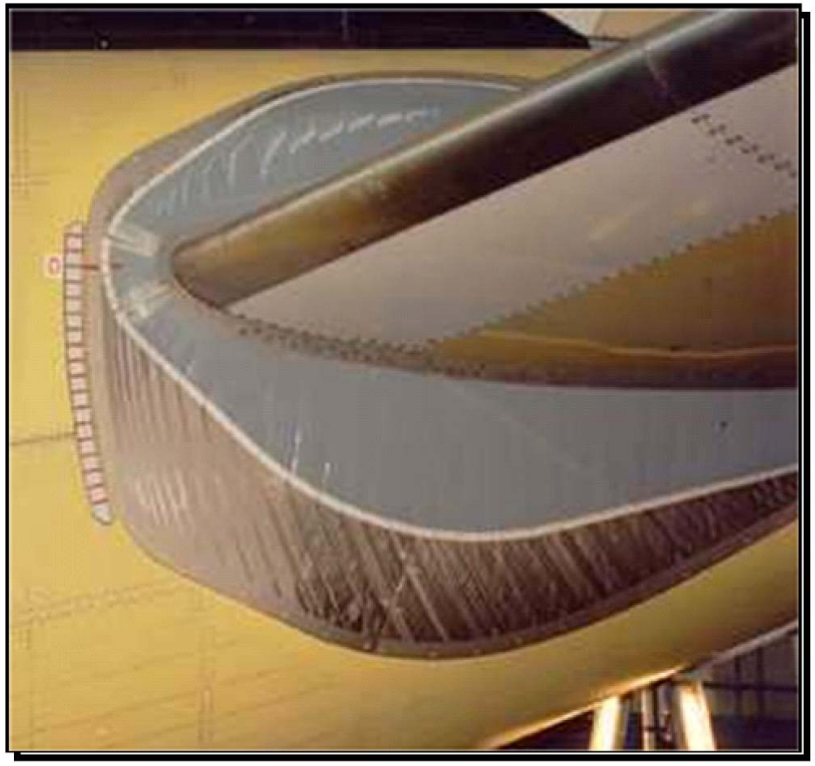
TRIMMABLE HORIZONTAL STABILIZER (THS) (continued)

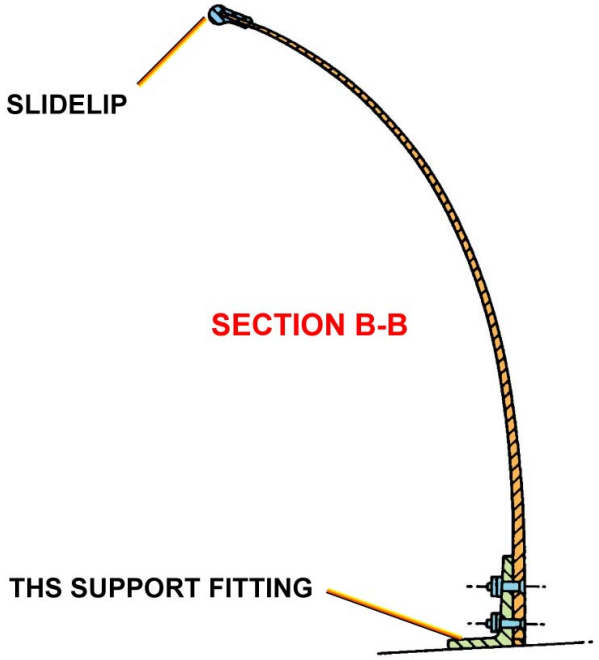
APRON

The horizontal stabilizer aprons have an aerodynamic seal between the horizontal stabilizer and the fuselage. Each apron has three sections, an upper, a lower and a forward section. The aprons are made of CFRP. To minimize friction between the aprons and the fuselage, the contact edge of each apron has a segmented lip of polytetra-fluorethylene (PTFE). The apron support fittings are made of aluminum alloy.









TRIMMABLE HORIZONTAL STABILIZER (THS) - APRON

STABILIZERS D/O (3)

ELEVATORS - STRUCTURE LAYOUT

Each elevator box has a: top and bottom skin panels, a front spar and eleven ribs. All are made of CFRP sandwich construction. A light-alloy profile (not shown) is riveted to the trailing edge to make it stronger. Each elevator has seven hinge support fittings, two actuator fittings and a position transducer fitting attached to the front spar. The rounded forward edge of the top and bottom skin panels shapes the elevator leading edge. Eleven ribs strength the leading edge. All components are made of CFRP.

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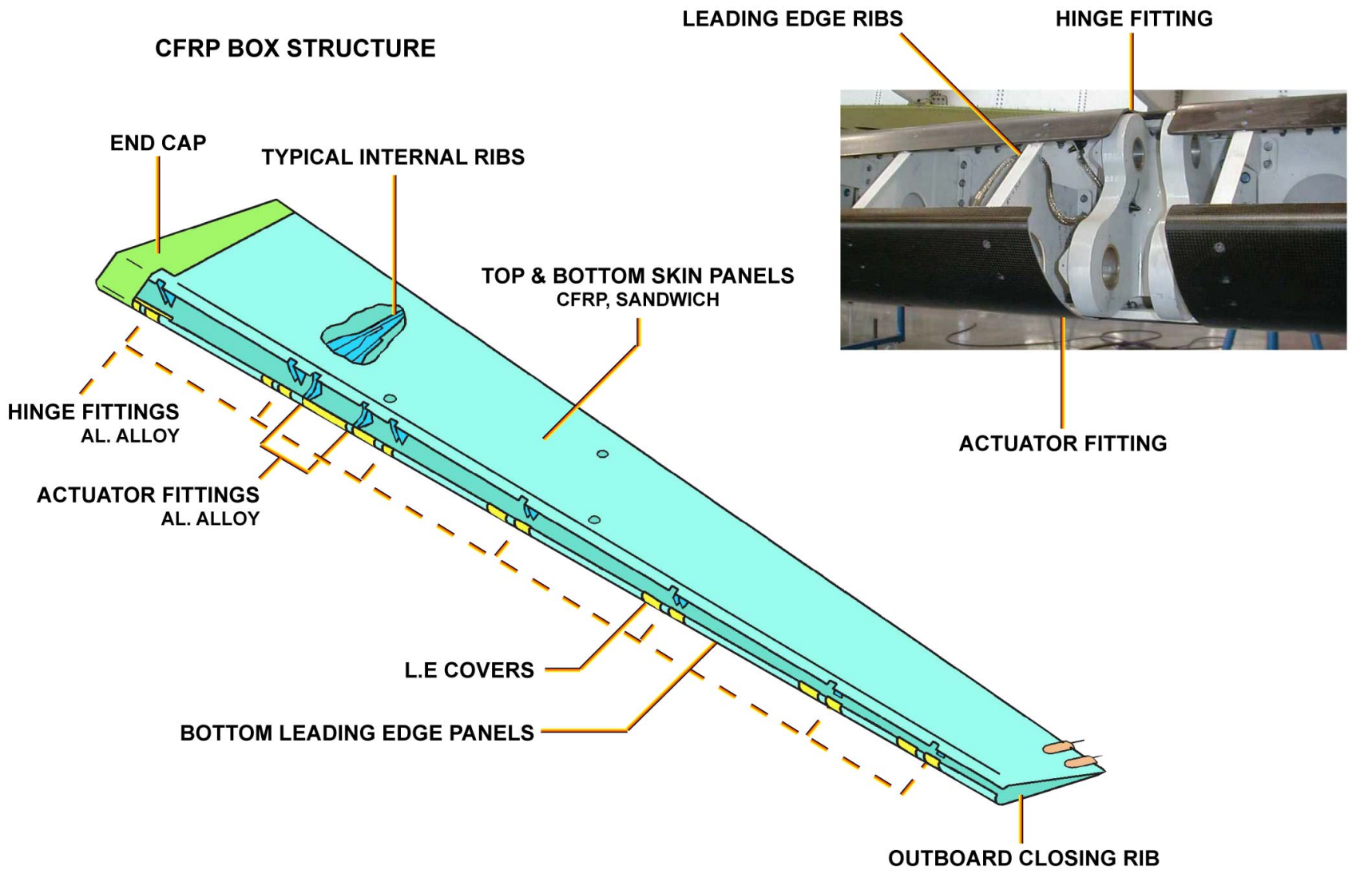


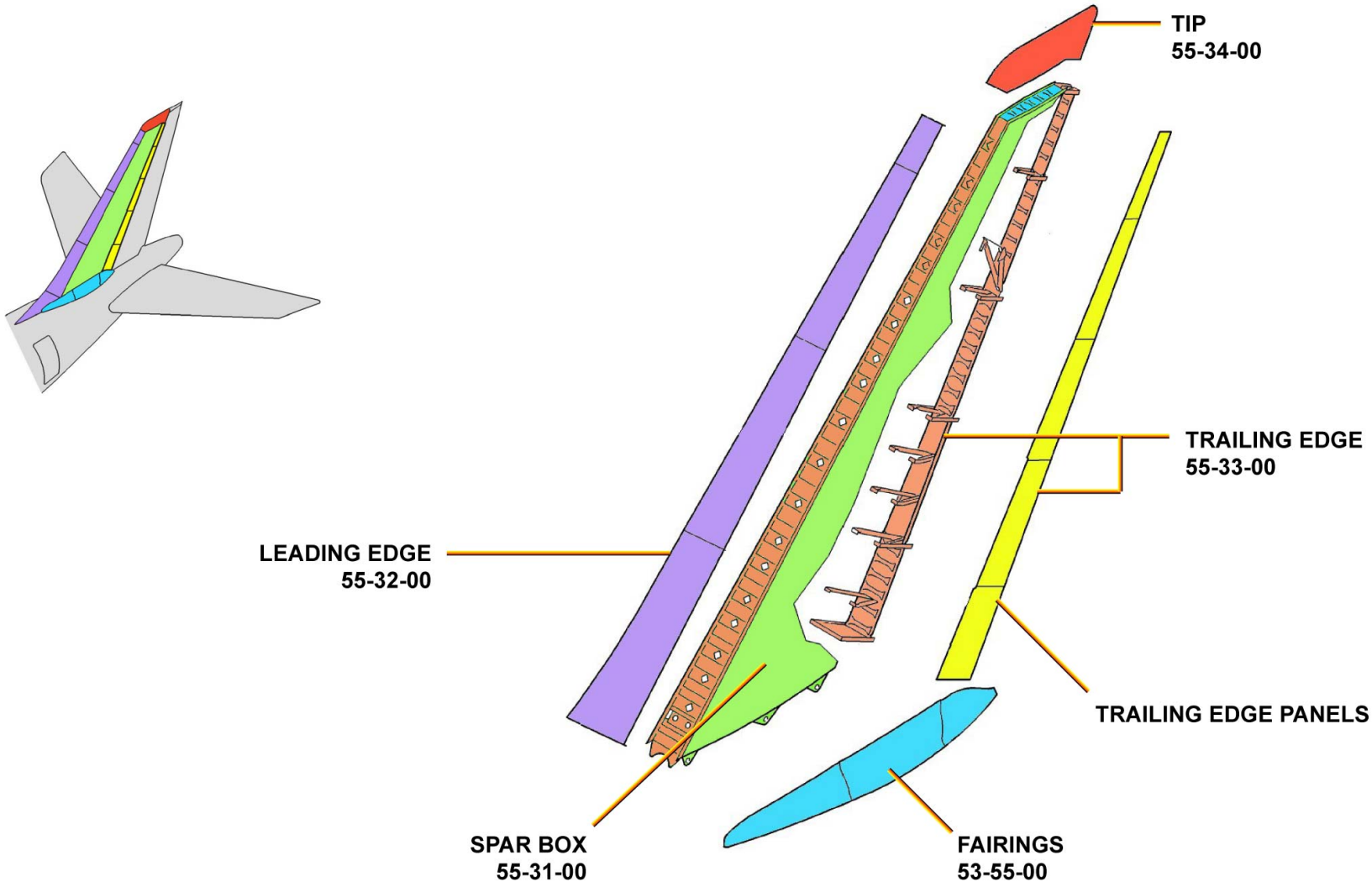
ELEVATORS - STRUCTURE LAYOUT

STABILIZERS D/O (3)

VERTICAL STABILIZER

GENERAL ARRANGEMENT

The vertical stabilizer is attached to the top of the rear fuselage. It supports the rudder, which is operated by three servo control units.
The High Frequency (HF) antenna and the Very high frequency Omnibearing Range (VOR) antenna are also attached to the top of the rear fuselage.
The main components of the vertical stabilizer are:
- the spar box,
- the leading edge,
- the trailing edge,
- the tip,
- the attach fittings.



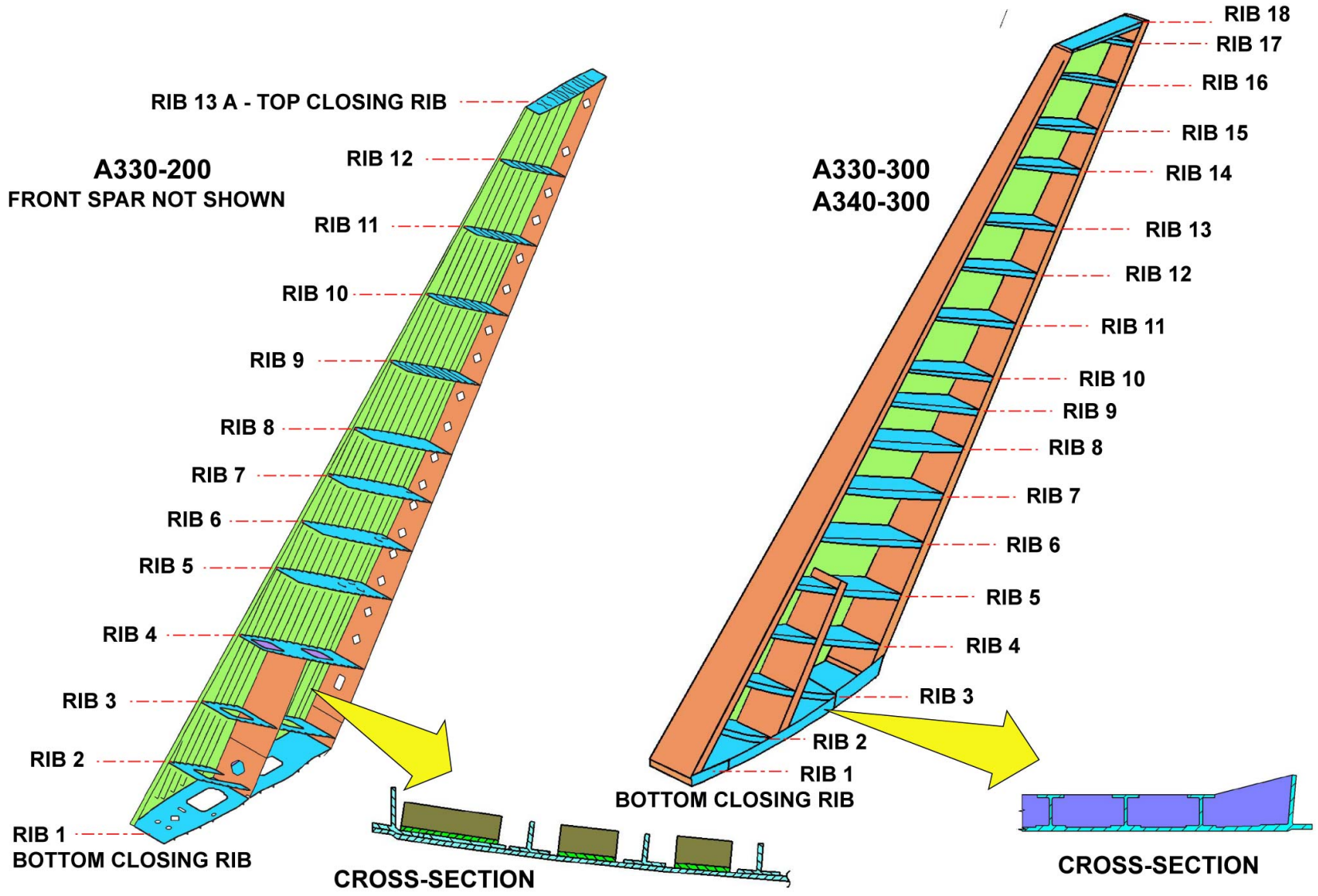
VERTICAL STABILIZER - GENERAL ARRANGEMENT

STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

SPAR BOX

The spar box is the primary structural component of the vertical stabilizer. All other components of the vertical stabilizer are attached to this spar box.
The main components of the spar box are: the front, the center and rear spars, the ribs and the side panels with integrated stiffeners, all made of CFRP.



VERTICAL STABILIZER - SPAR BOX

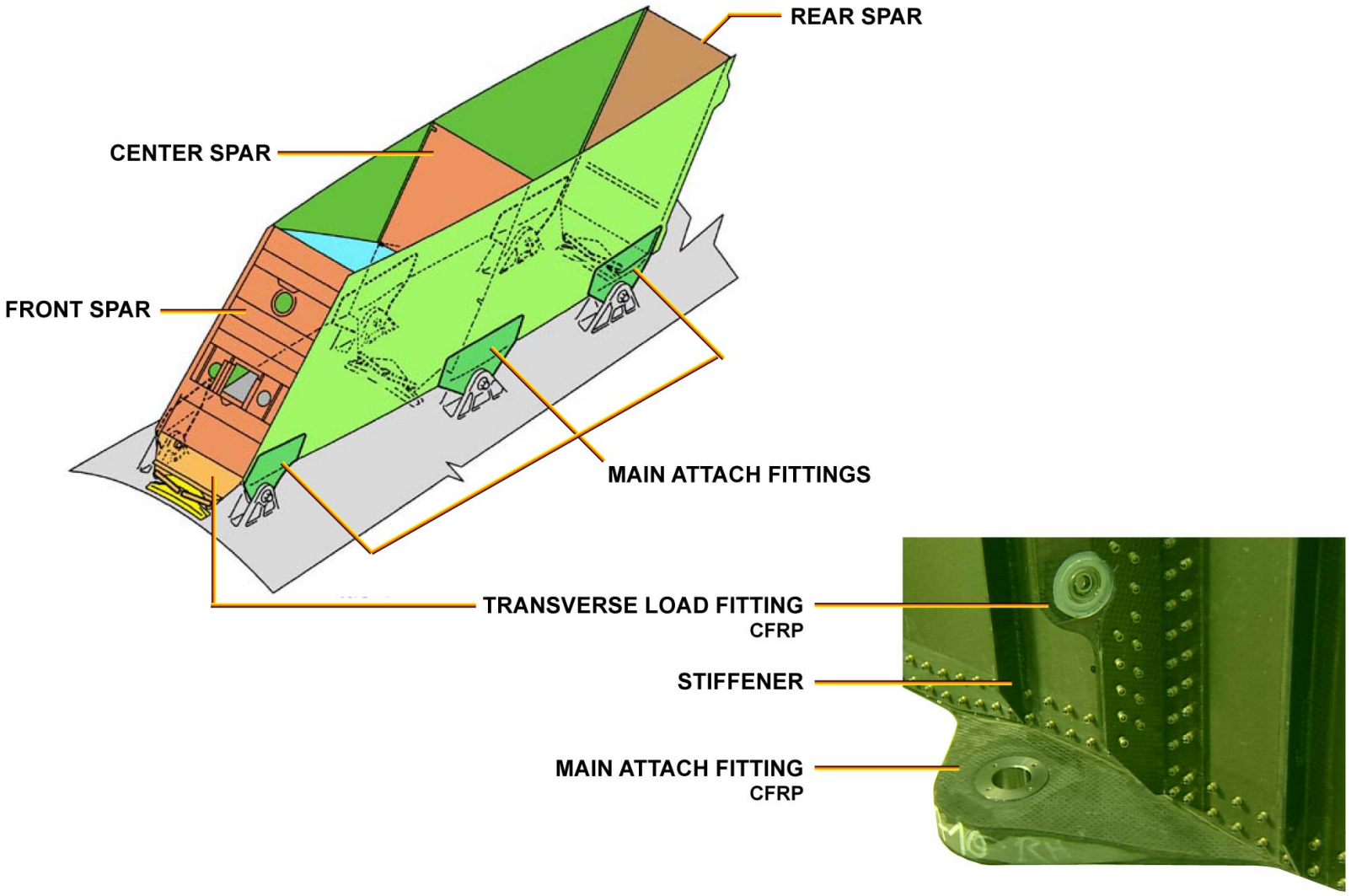
STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

FUSELAGE ATTACHMENT

The vertical stabilizer has six main attach fittings. They are made of CFRP and are bonded to the lower end of the skin panels (the skin, the stringers, the flanges and three fuselage attach fittings are one unit). The fittings are installed in pairs at the front, the center and the rear spar.

The three transverse load fittings are made of CFRP. They are bonded to the lower end of the front, the center and the rear spar. The transverse load fittings transmit the transverse loads of the vertical stabilizer to the fuselage.



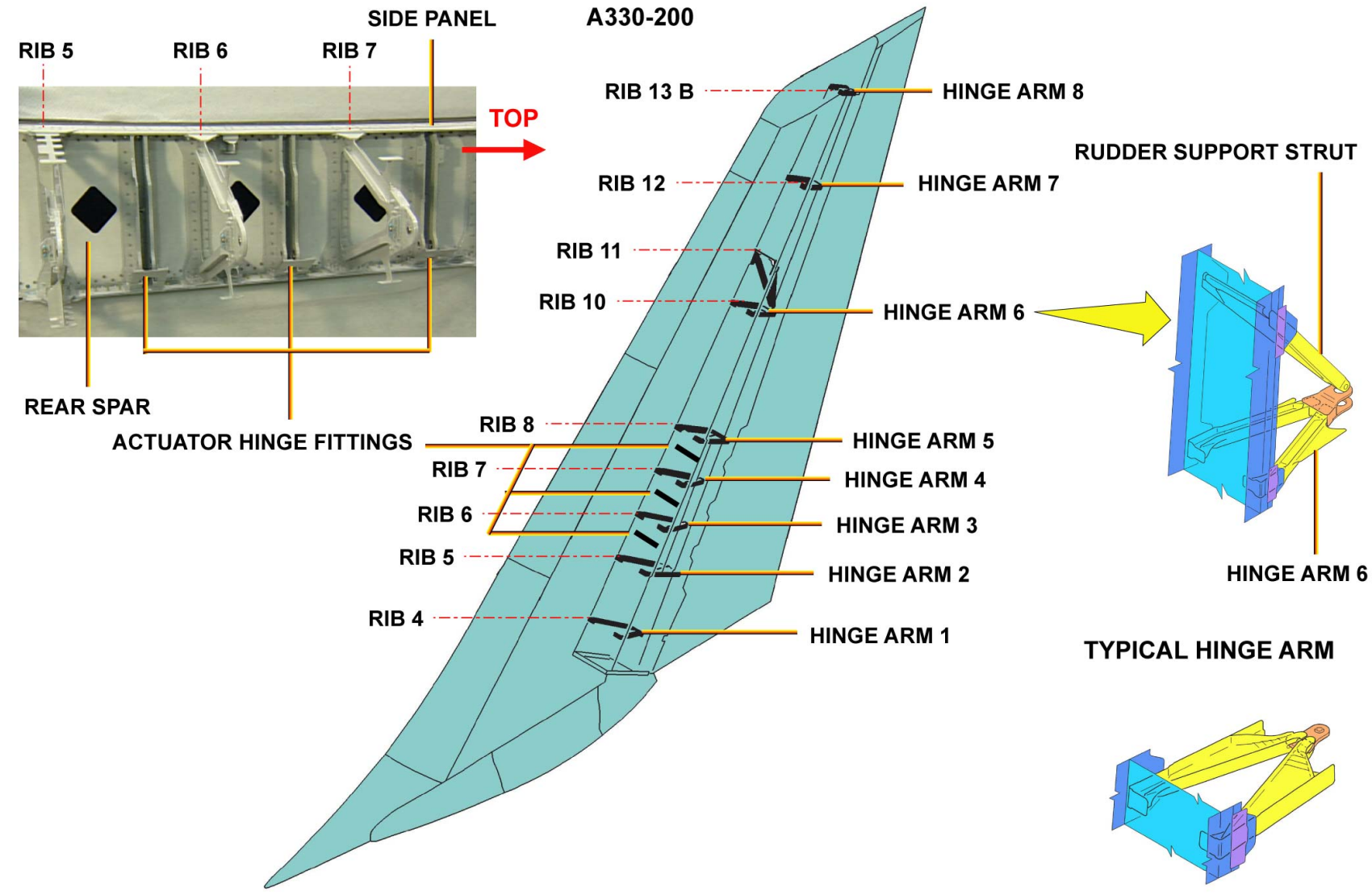
VERTICAL STABILIZER - FUSELAGE ATTACHMENT

STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

RUDDER ATTACHMENT

On the A330-200, the eight rudder hinge arms and the three actuator hinge fittings are made from aluminum alloy. They are attached to the spar box rear spar.



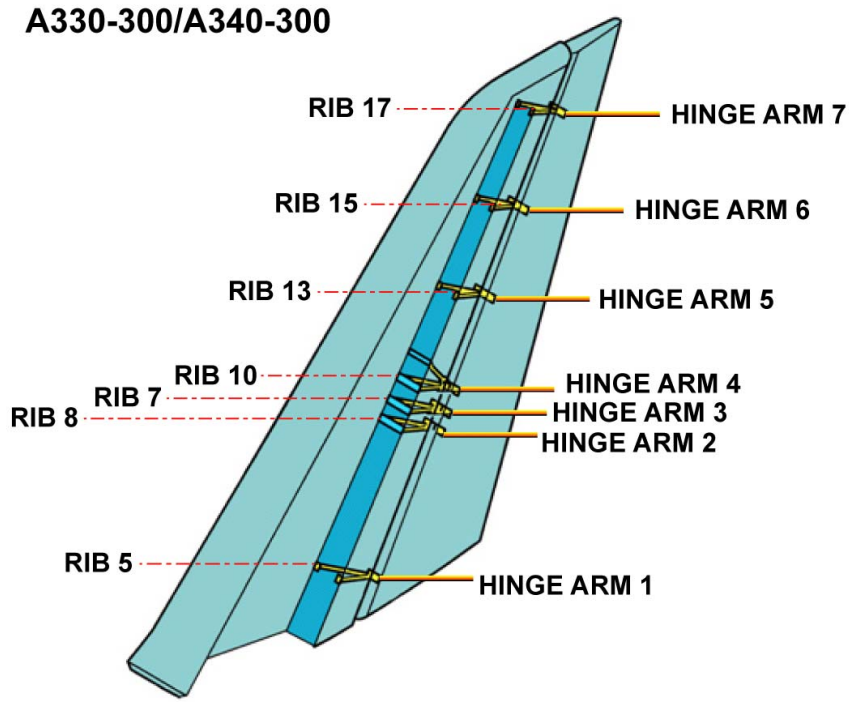
VERTICAL STABILIZER - RUDDER ATTACHMENT

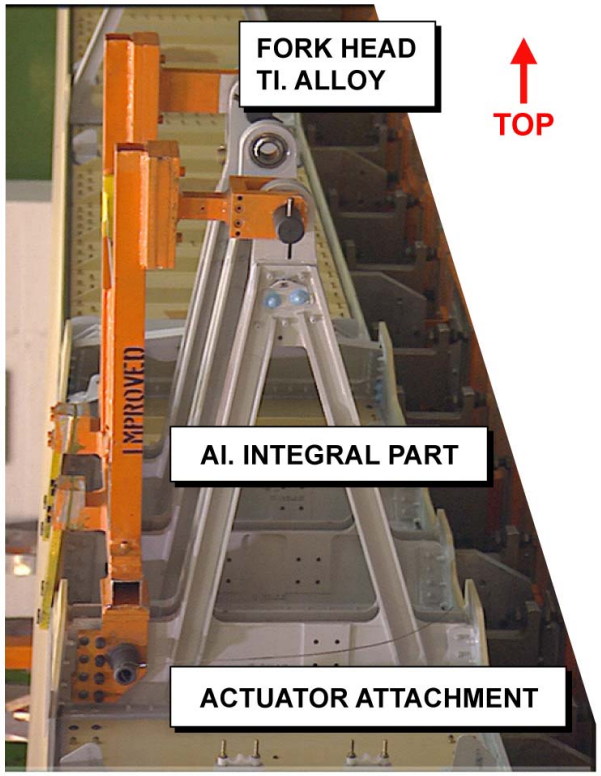
STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

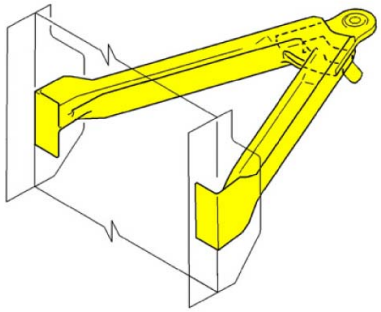
RUDDER ATTACHMENT (CONT'D)

On the A340-300, the seven rudder hinge arms and the three actuator hinge fittings are made from aluminum alloy. They are attached to the spar box rear spar.

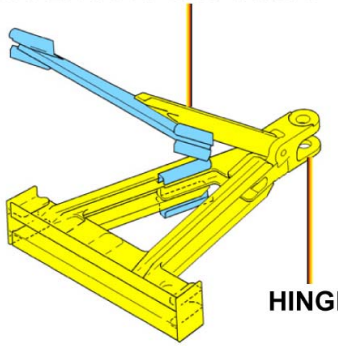




TYPICAL HINGE ARM



RUDDER SUPPORT STRUT



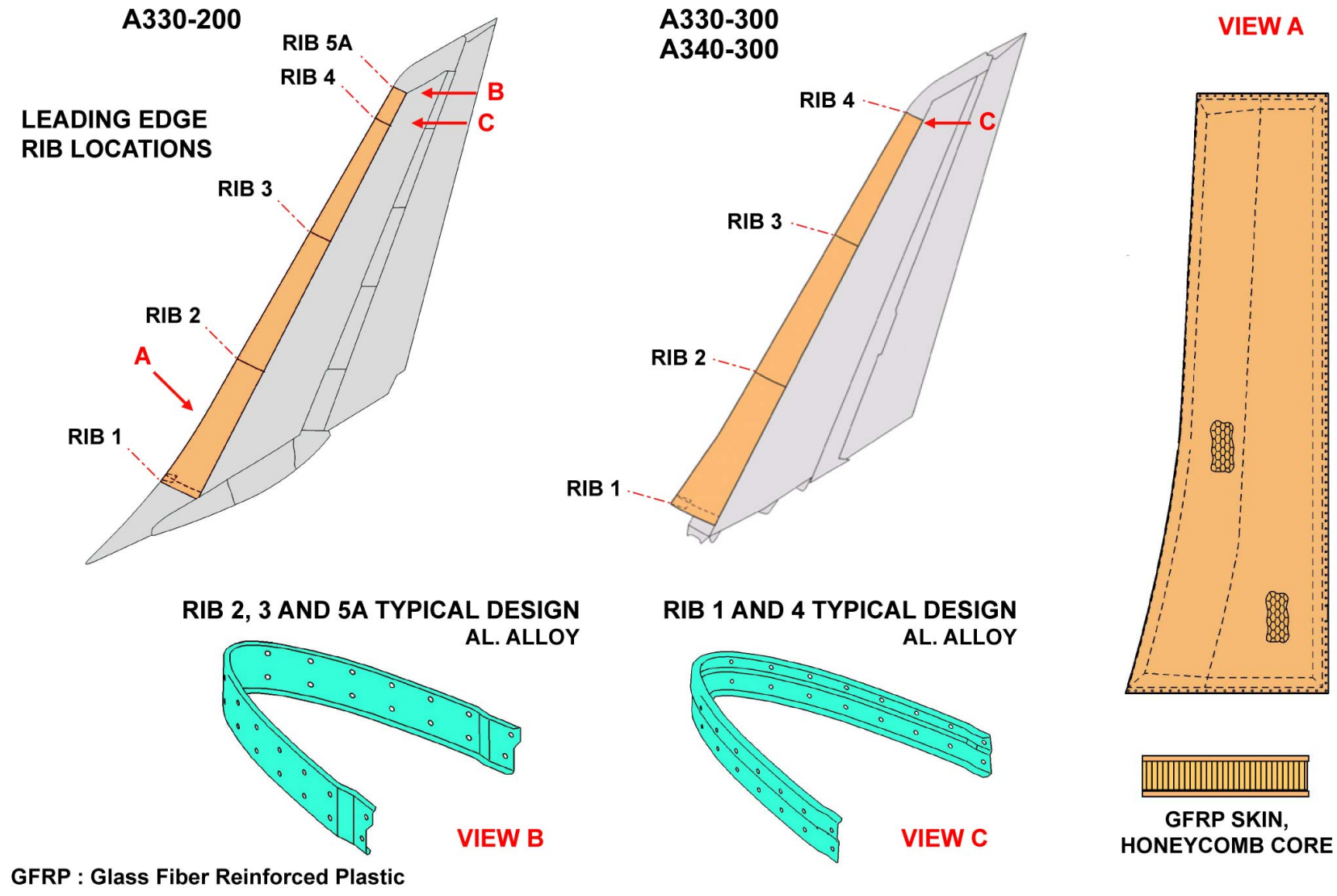
VERTICAL STABILIZER - RUDDER ATTACHMENT (CONT'D)

STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

LEADING EDGE

The vertical stabilizer leading edge has three or four removable sections. They are attached to the forward edge of the spar box side panels and to the leading edge ribs. The lower section gives access to the HF antenna. The four sections give an aerodynamic shape to the front of the vertical stabilizer. The four sections are made of Glass Fiber Reinforced Plastic (GFRP) sandwich construction. A protective foil is bonded to the inner surfaces of the sections. Countersunk screws attach the leading edge sections to the front spar and to the leading edge ribs.



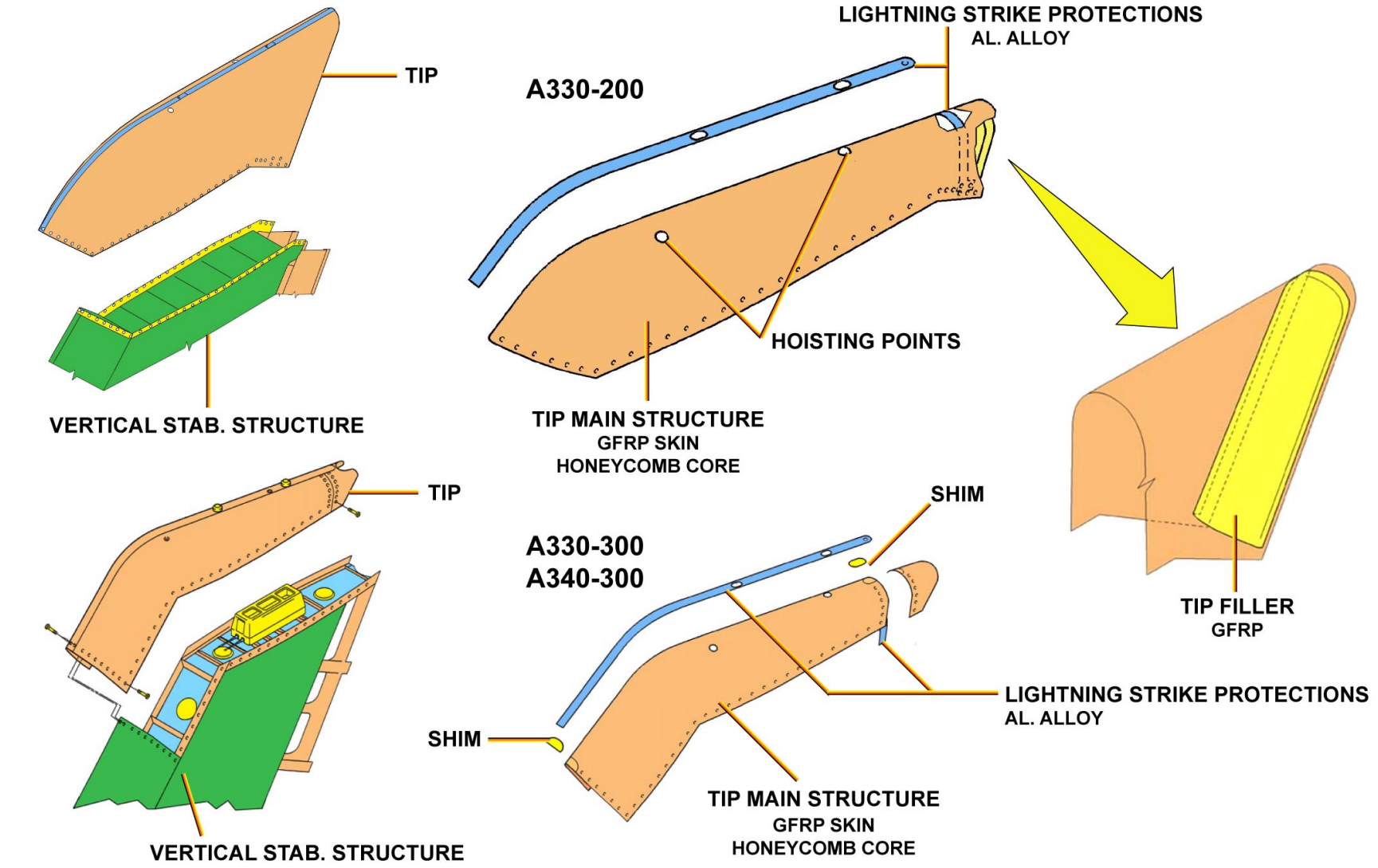
VERTICAL STABILIZER - LEADING EDGE

STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

TIP

The tip is the upper fairing of the vertical stabilizer. It is attached to the top of the spar box and to the front spar. It is made of GFRP skin bonded to a honeycomb core. An aluminum alloy strap is installed on the top of the tip for lightning strike protection.



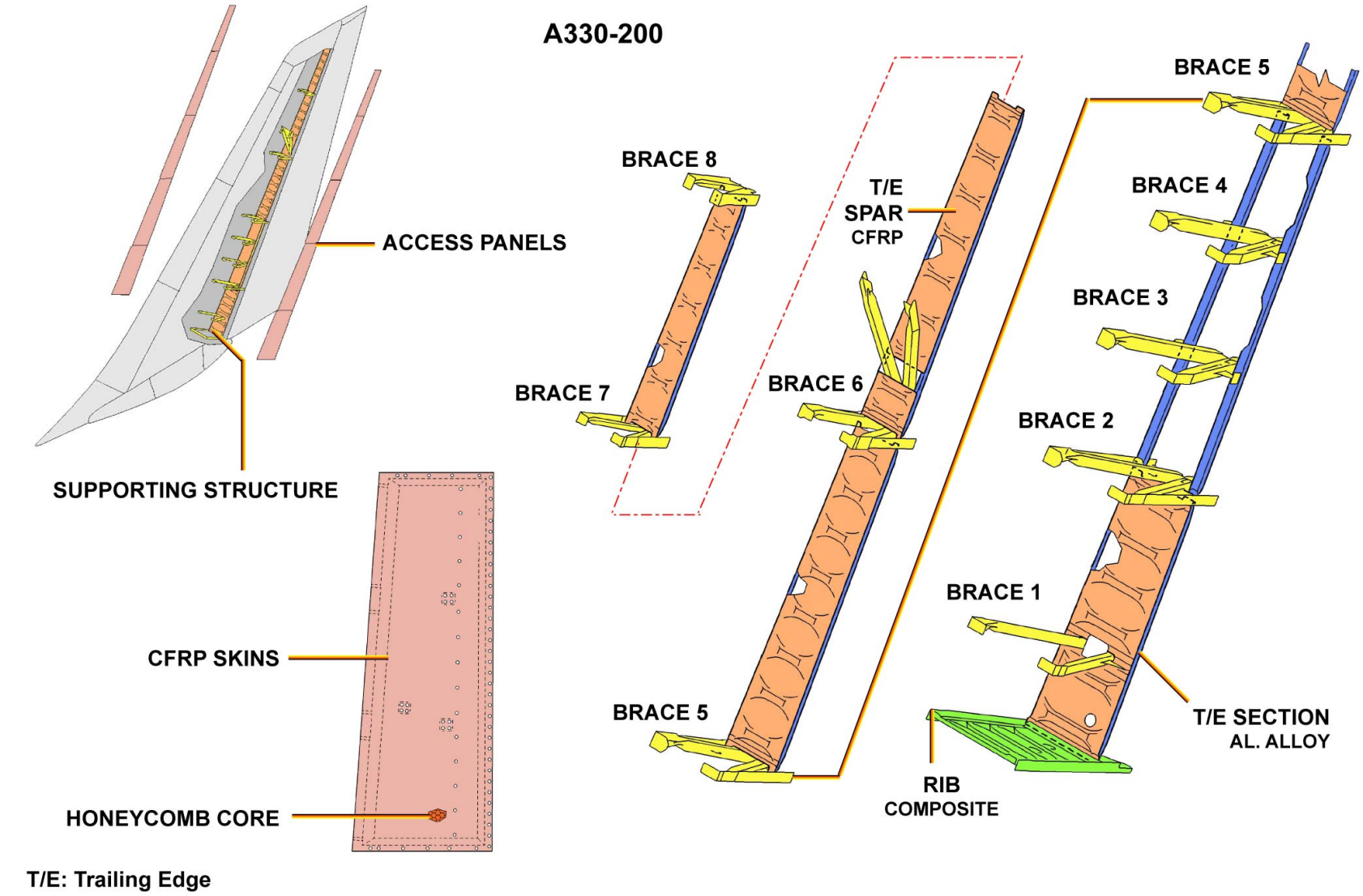
VERTICAL STABILIZER - TIP

STABILIZERS D/O (3)

VERTICAL STABILIZER (continued)

TRAILING EDGE

The trailing edge is attached to the rear of the vertical stabilizer. It has a basic framework made of aluminum and ten access panels (five on each side). The panels give access to the rudder hydraulics, the servo controls, the control rods and the hinge fittings. The panels are made of CFRP sandwich construction.



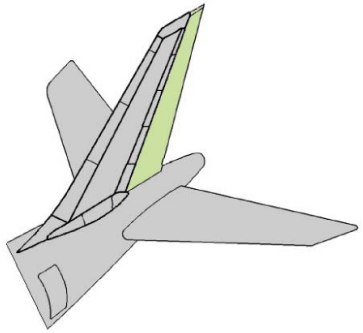
VERTICAL STABILIZER - TRAILING EDGE

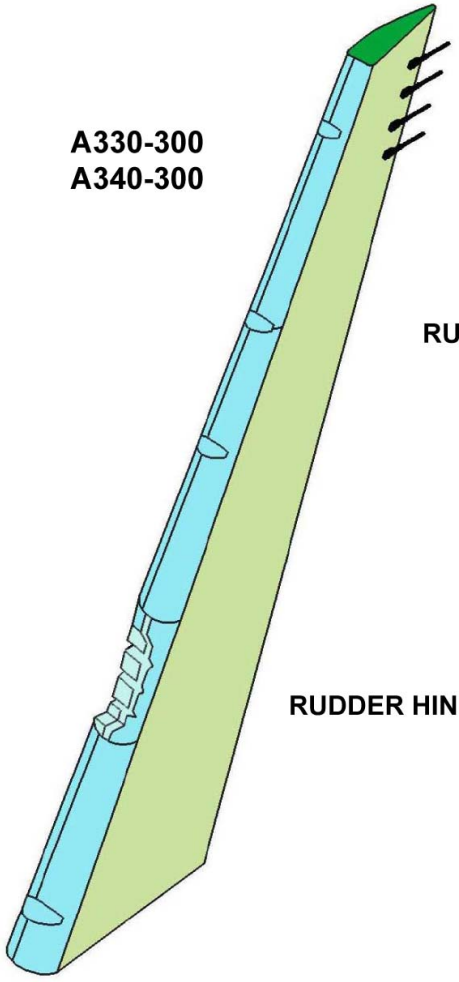
STABILIZERS D/O (3)

RUDDER

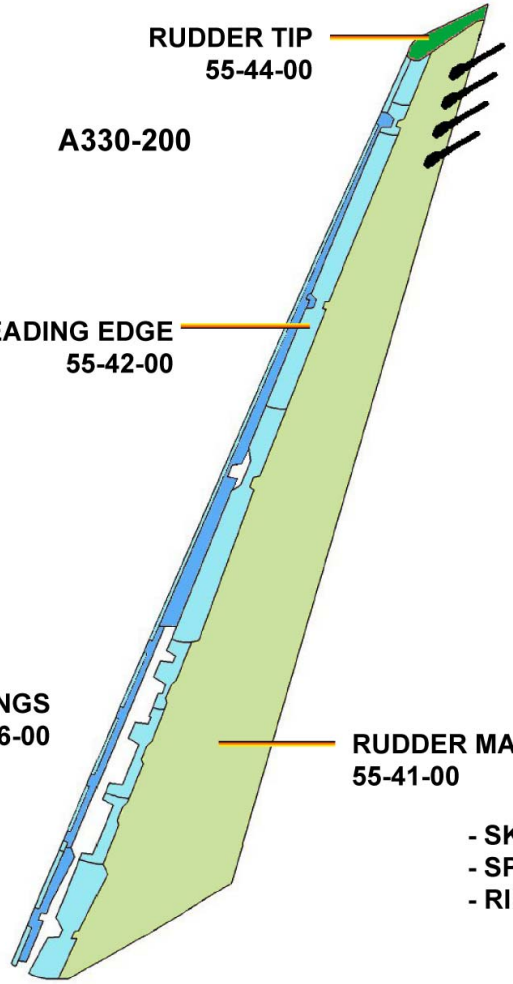
GENERAL ARRANGEMENT

The rudder is one of the primary flight controls of the aircraft.
The main components of the rudder are:
- the main structure,
- the leading edge panels and ribs made of CFRP,
- the aluminum alloy tip,
- the seven (A330-300) or height (A330-200) hinge fittings and the three actuator fittings.





A330-300
A340-300



A330-200

RUDDER TIP
55-44-00

RUDDER LEADING EDGE
55-42-00

RUDDER HINGE FITTINGS
55-46-00

RUDDER MAIN STRUCTURE
55-41-00

- SKIN PANELS
- SPAR
- RIBS

RUDDER - GENERAL ARRANGEMENT

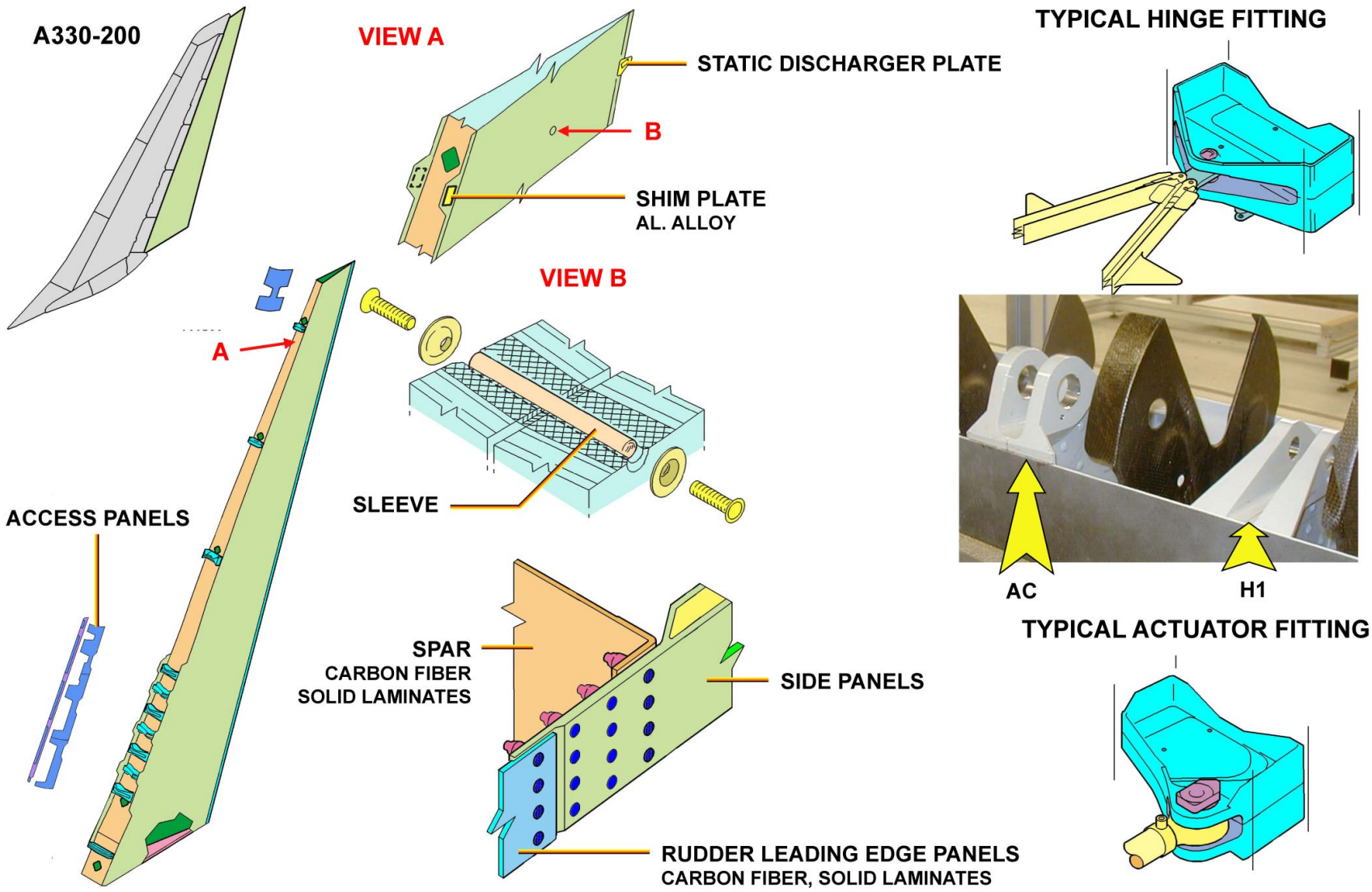
STABILIZERS D/O (3)

RUDDER (continued)

STRUCTURE LAYOUT

The rudder main structure is the primary structural component of the rudder.
It has an assembly of:
- two skin panels made of CFRP sandwich construction,
- a carbon fiber front spar,
- a bottom carbon fiber closing rib
- a top aluminum alloy closing rib.

All the other components of the rudder are attached to the rudder main structure. Four access panels give access to the hinge fittings. Four static dischargers are installed on the upper part of the rudder trailing edge.



RUDDER - STRUCTURE LAYOUT

WINDOWS D/O (3)

GENERAL

The windows are installed in:
- the cockpit,
- the cabin,
- the doors,
- inspection and observation areas.

All the windows, which are installed in pressurized areas of the fuselage structure, are fail-safe.

A340-600
A340-500
A340-300
A330-300
A330-200
A340
A330
COCKPIT WINDOWS
56-10-00
DOOR WINDOWS
56-30-00
CABIN WINDOWS
56-20-00

GENERAL

WINDOWS D/O (3)

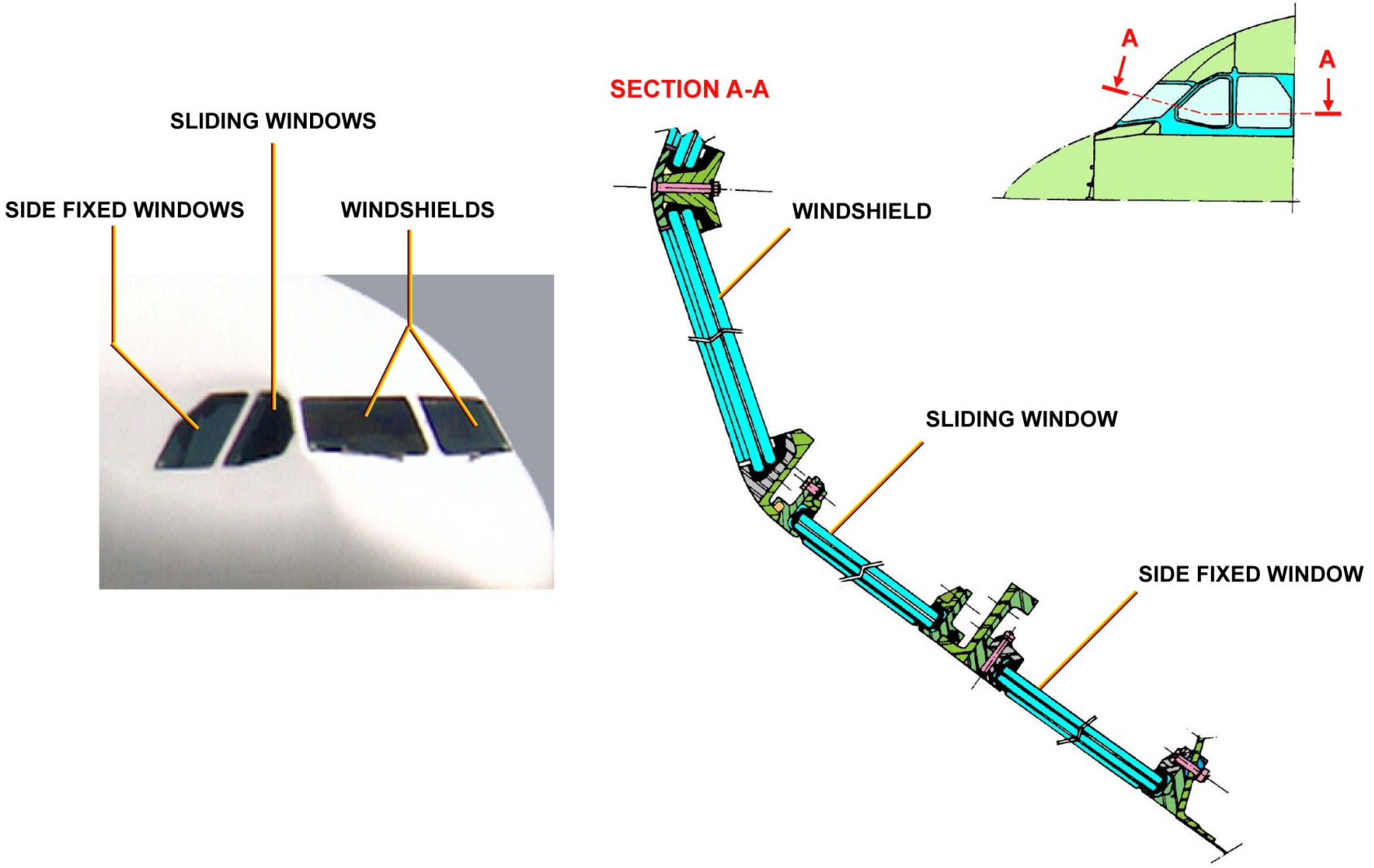
COCKPIT WINDOWS

GENERAL ARRANGEMENT

There are two types of windows:
- the fixed windows,
- the sliding windows.

Fixed Windows:
There are four fixed windows installed in the cockpit:
- two windshields,
- two fixed side windows.

The left and right windows are symmetrical.
These windows are mounted in a frame. This frame enables the removal and installation of these windows from the outside.
Sliding Windows:
The sliding windows are installed on a mobile frame fitted with a mechanism which is controlled from the cockpit.
To meet the correct in flight visibility conditions required, the cockpit windows are protected against the ice, mist and rain.
- the windshield against the ice, mist and rain,
- the side windows against the mist.



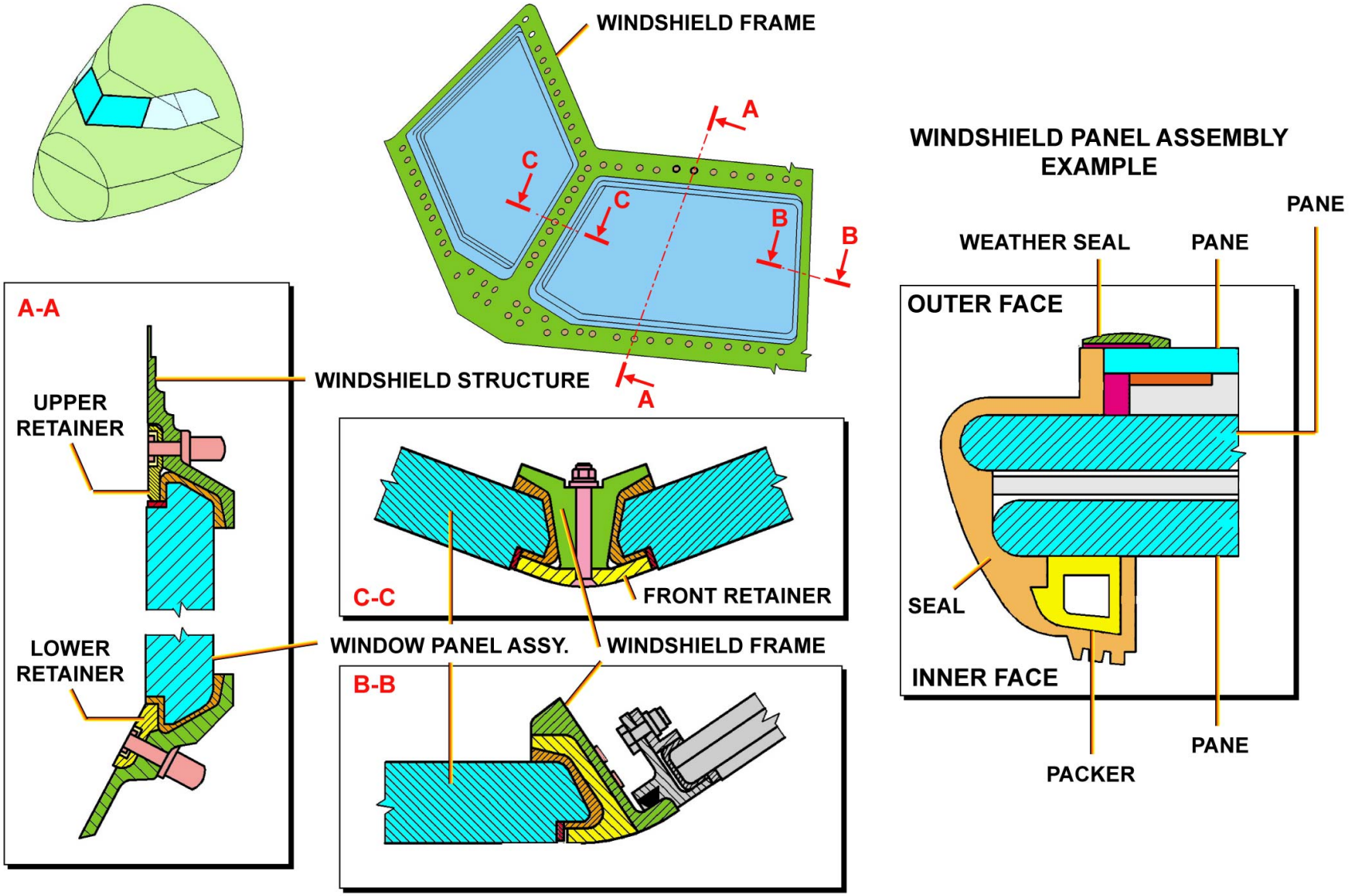
COCKPIT WINDOWS - GENERAL ARRANGEMENT

WINDOWS D/O (3)

COCKPIT WINDOWS (continued)

WINDSHIELDS

Frame:
The windshield panels are mounted in a frame integrated into the nose structure.
The panels are held in position by three retainers (upper, lower and front) bolted to the outer face of the frame.
Windshield panel assembly:
The windshield panel assembly is made up of several panes of different materials (from ext. to int.):
glass, PU (Polyurethane), glass, PVB (Polyvinyl Butyral), glass.



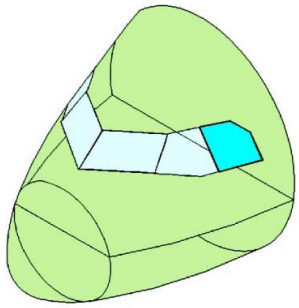
COCKPIT WINDOWS - WINDSHIELDS

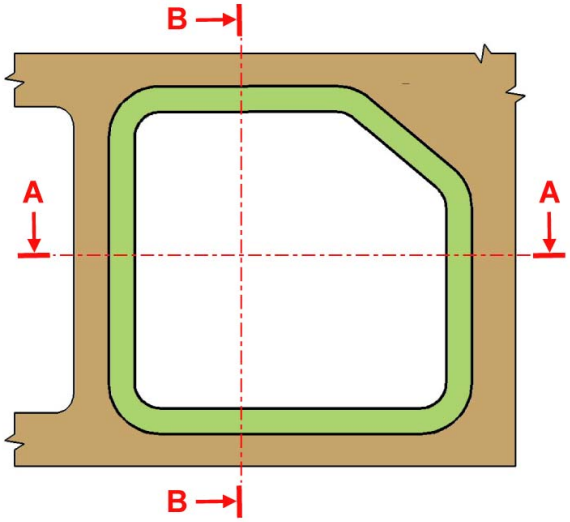
WINDOWS D/O (3)

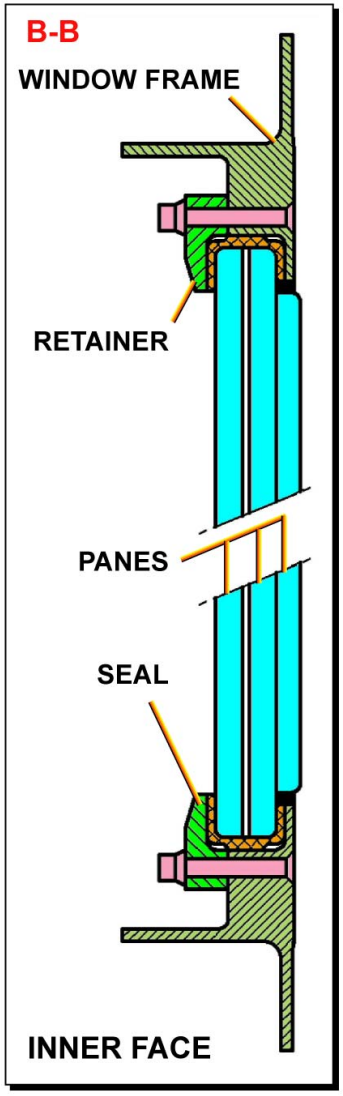
COCKPIT WINDOWS (continued)

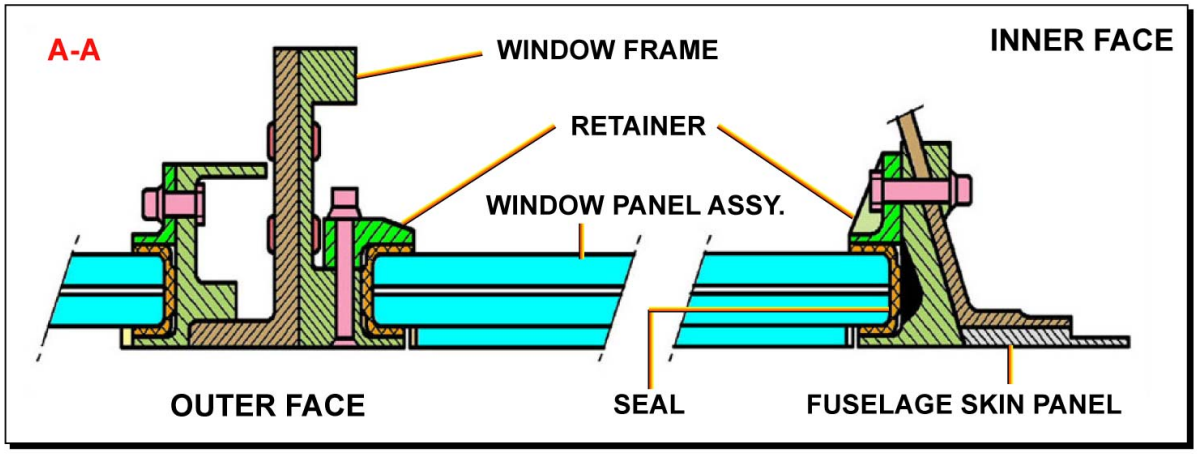
SIDE FIXED WINDOWS

Frame:
The window panels are held in position on a removable frame, by a retainer.
The frame assembly is also bolted on to the aircraft frame and is sealed by a sealing compound.
Window panel assembly:
The window panel assembly is made of several panes of different materials (same as fixed windows).









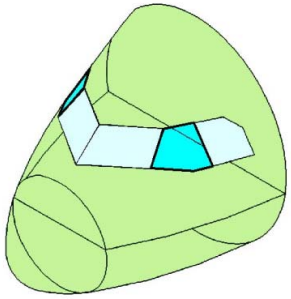
COCKPIT WINDOWS - SIDE FIXED WINDOWS

WINDOWS D/O (3)

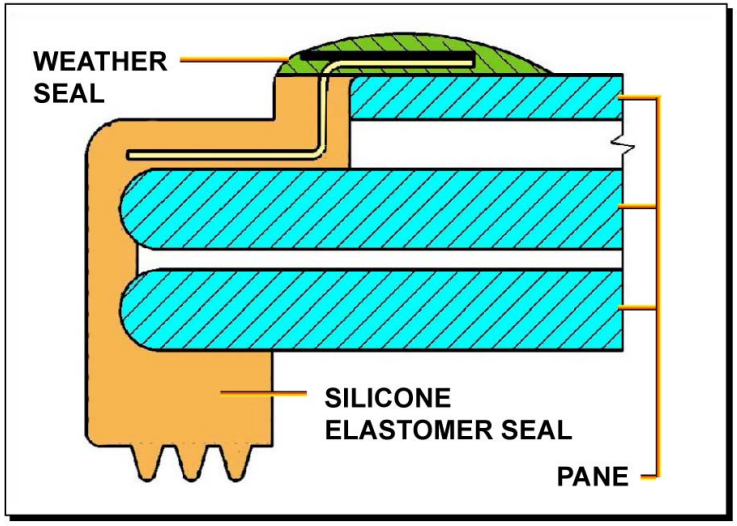
COCKPIT WINDOWS (continued)

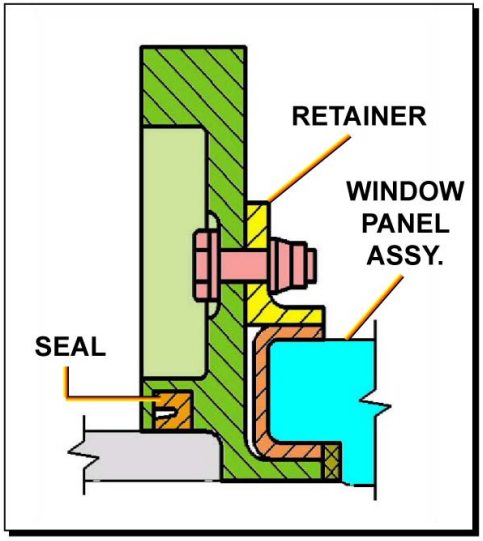
SLIDING WINDOWS

Mobile frame:
The sliding windows are installed on a mobile frame fitted with a mechanism which is controlled from the cockpit.
The panels are held in position by three retainers bolted to the outer face of the frame.
Window panel assembly:
The window panel assembly is made of several panes of different materials.



WINDOW PANEL ASSEMBLY EXAMPLE

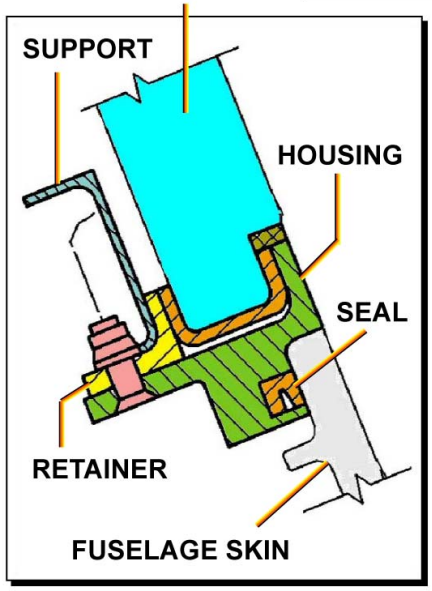


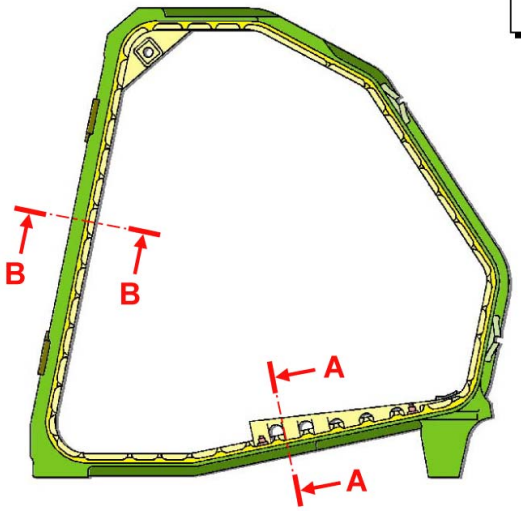


SECTION B-B

WINDOW PANEL ASSEMBLY

SECTION A-A



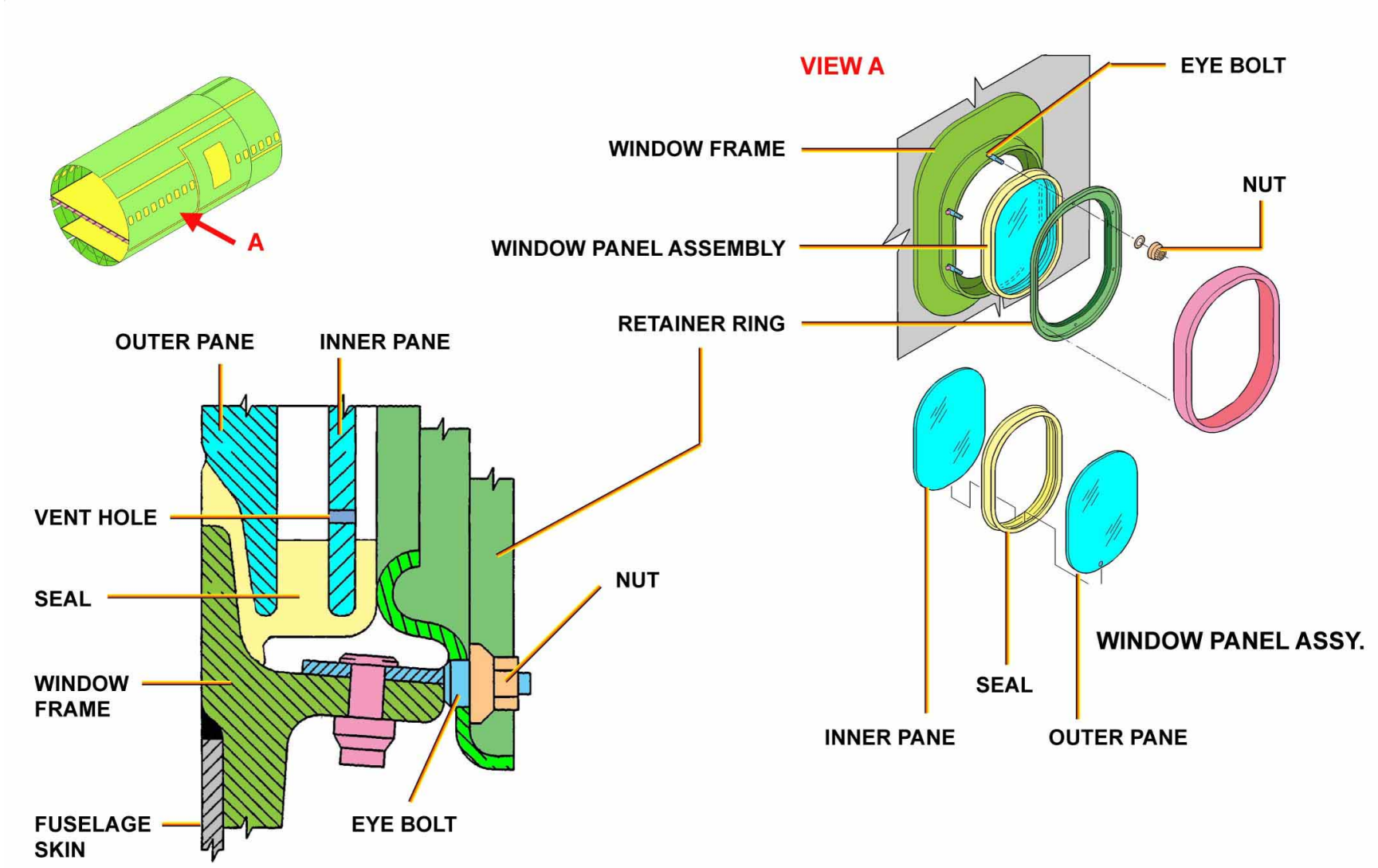


COCKPIT WINDOWS - SLIDING WINDOWS

WINDOWS D/O (3)

CABIN WINDOWS - GENERAL ARRANGEMENT

The windows are installed in window frames and make a smooth surface with the fuselage skin.
The cabin windows are installed and removed from inside the aircraft.
Cabin Windows:
The cabin windows are installed in the seating areas of the cabin.
A retainer ring, eye-bolts and nuts, hold each cabin window in a window frame.
Each window panel assembly has an inner pane and a outer pane which are made from acrylic resin.
There is a small hole (vent hole) in the bottom part of the inner pane.
This lets the pressure between the two panes stay the same as that in the cabin.
Cabin Dummy Windows (not shown):
In areas of the cabin where equipment and furnishings (e.g. galleys and lavatories etc.) are located, cabin dummy windows are installed.
A retainer ring, eye-bolts and nuts, hold each cabin dummy window in a window frame.

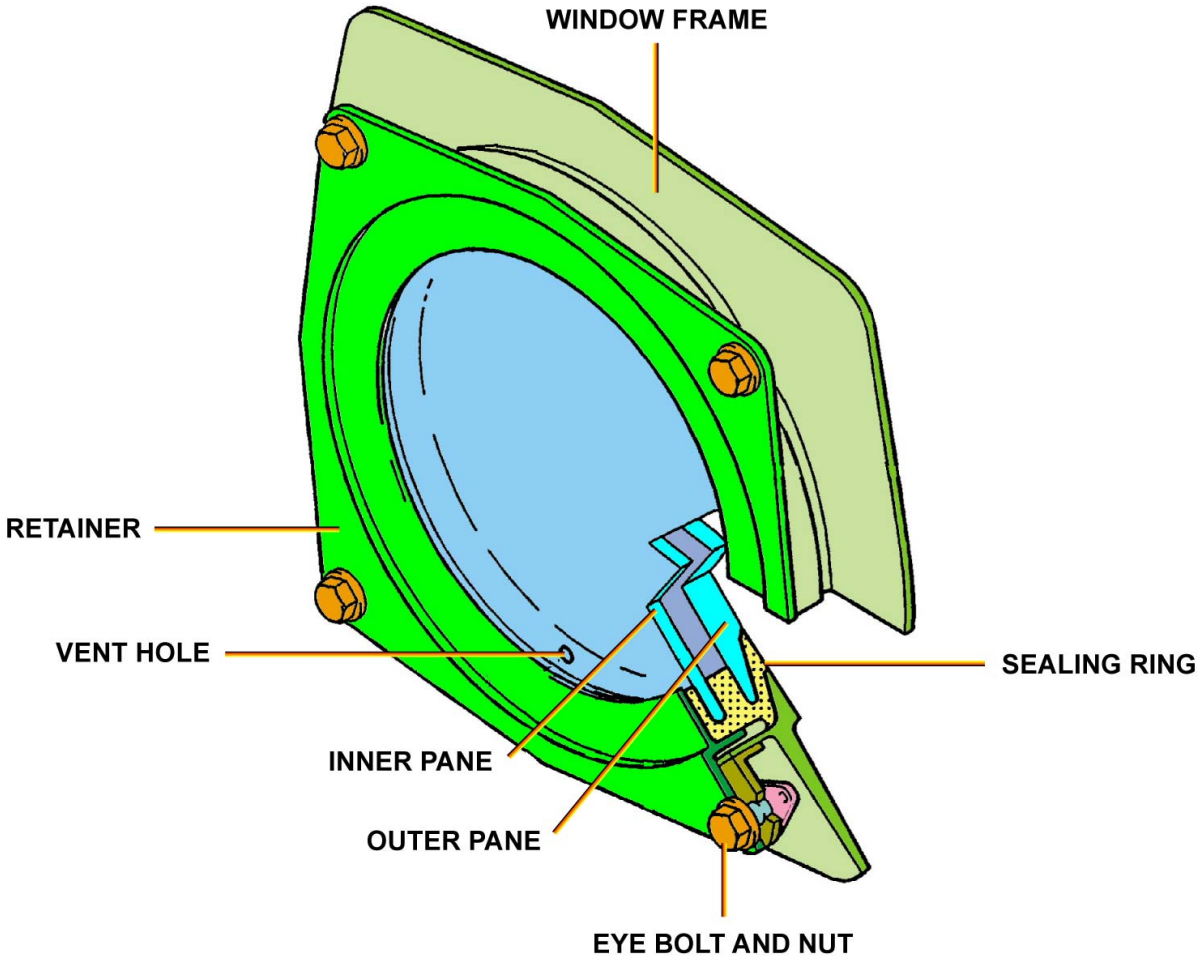


CABIN WINDOWS - GENERAL ARRANGEMENT

WINDOWS D/O (3)

DOOR WINDOWS - STRUCTURE LAYOUT

The passenger / crew doors and emergency exit doors have a circular window, which is installed in a window frame. These windows are used for inspection and observation.
Each door window is installed near the inner handle. It is installed in a window frame, which is attached to the outer skin of the door. A retainer ring holds the door window in a window frame.
Each window panel assembly as an inner pane and a outer pane which are made from acrylic resin.
There is a small hole (vent hole) in the bottom part of the inner pane. This lets the pressure between the two panes stay the same as that in the cabin.



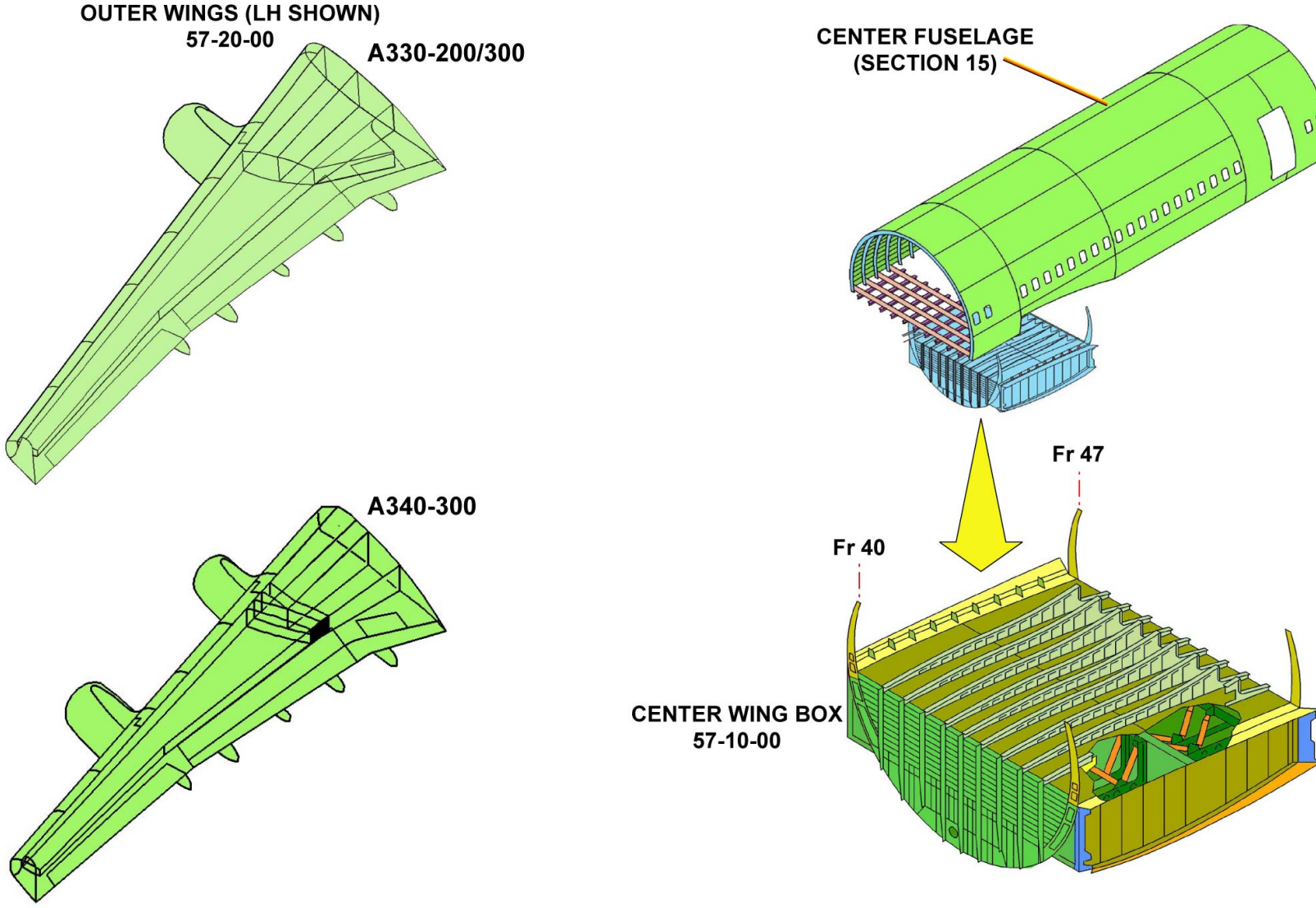
DOOR WINDOWS - STRUCTURE LAYOUT

WINGS D/O (3)

GENERAL

The aircraft wing is a continuous structure going through the fuselage and is divided into three parts:
- the center wing,
- the left outer wing,
- and the right outer wing.

The center wing box supplies cantilever attachment for the outer wings and applies its loads onto the fuselage structure.


OUTER WINGS (LH SHOWN)
57-20-00
A330-200/300
A340-300
CENTER FUSELAGE
(SECTION 15)
Fr 47
Fr 40
CENTER WING BOX
57-10-00

GENERAL

WINGS D/O (3)

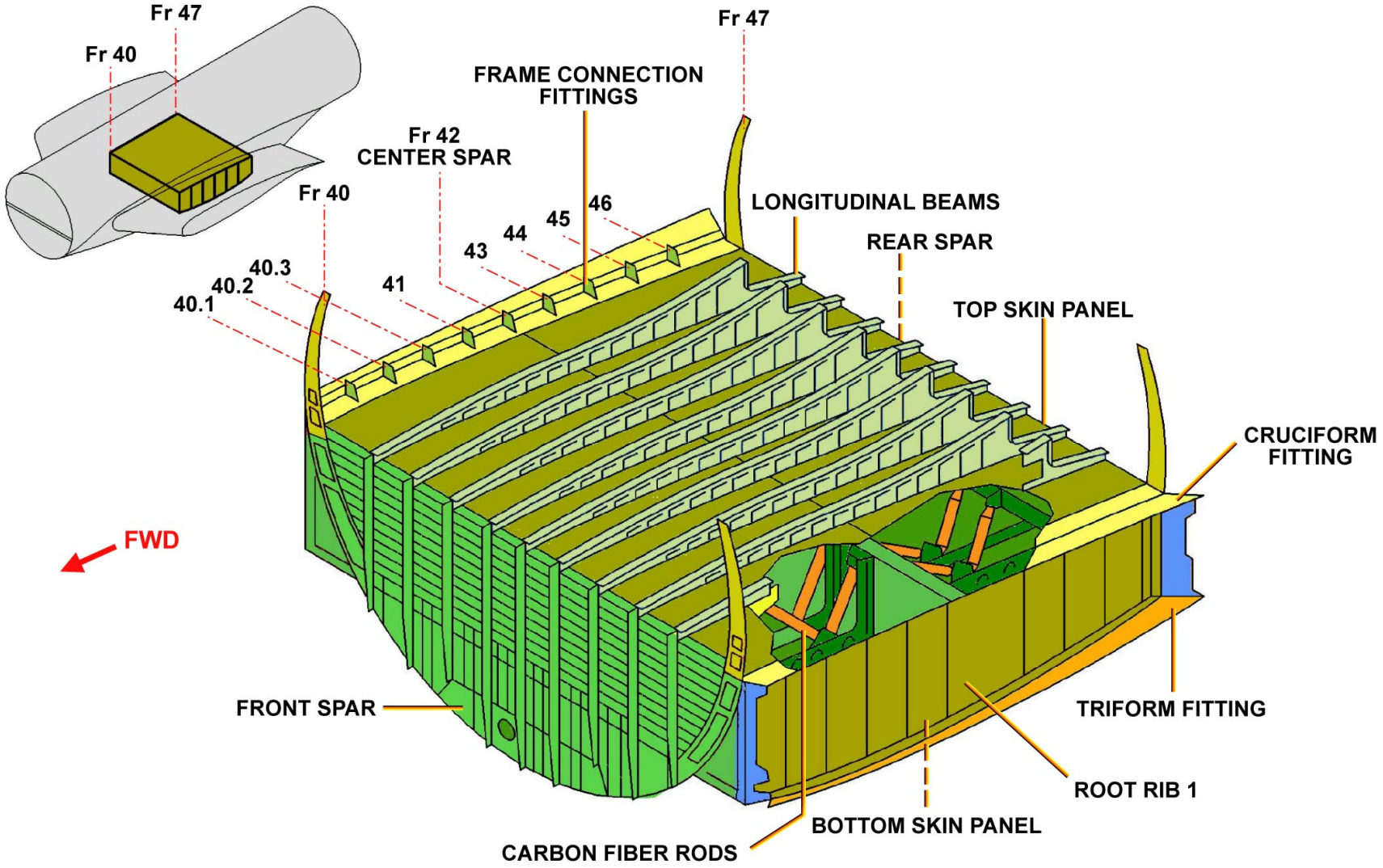
CENTER WING BOX

GENERAL ARRANGEMENT

The center wing is installed in the center fuselage between the main Frames 40 and 47, and makes an integral fuel tank.
The center wing box structure includes:
- the front, center and rear spars respectively located at frames (Fr) 40, 42 and 47,
- top and bottom skin panels,
- the two main frames 40 and 47,
- internal carbon-fiber rods,
- the left rib 1 and the right rib 1,
- frame connection fittings,
- longitudinal beams.

There are two triangular openings in the rear spar to enable the access for maintenance.

G4J06491 - G0UT1M0 - FM51DK000000001



CENTER WING BOX - GENERAL ARRANGEMENT

G4J06491 - G0UT1M0 - FM51DK000000001

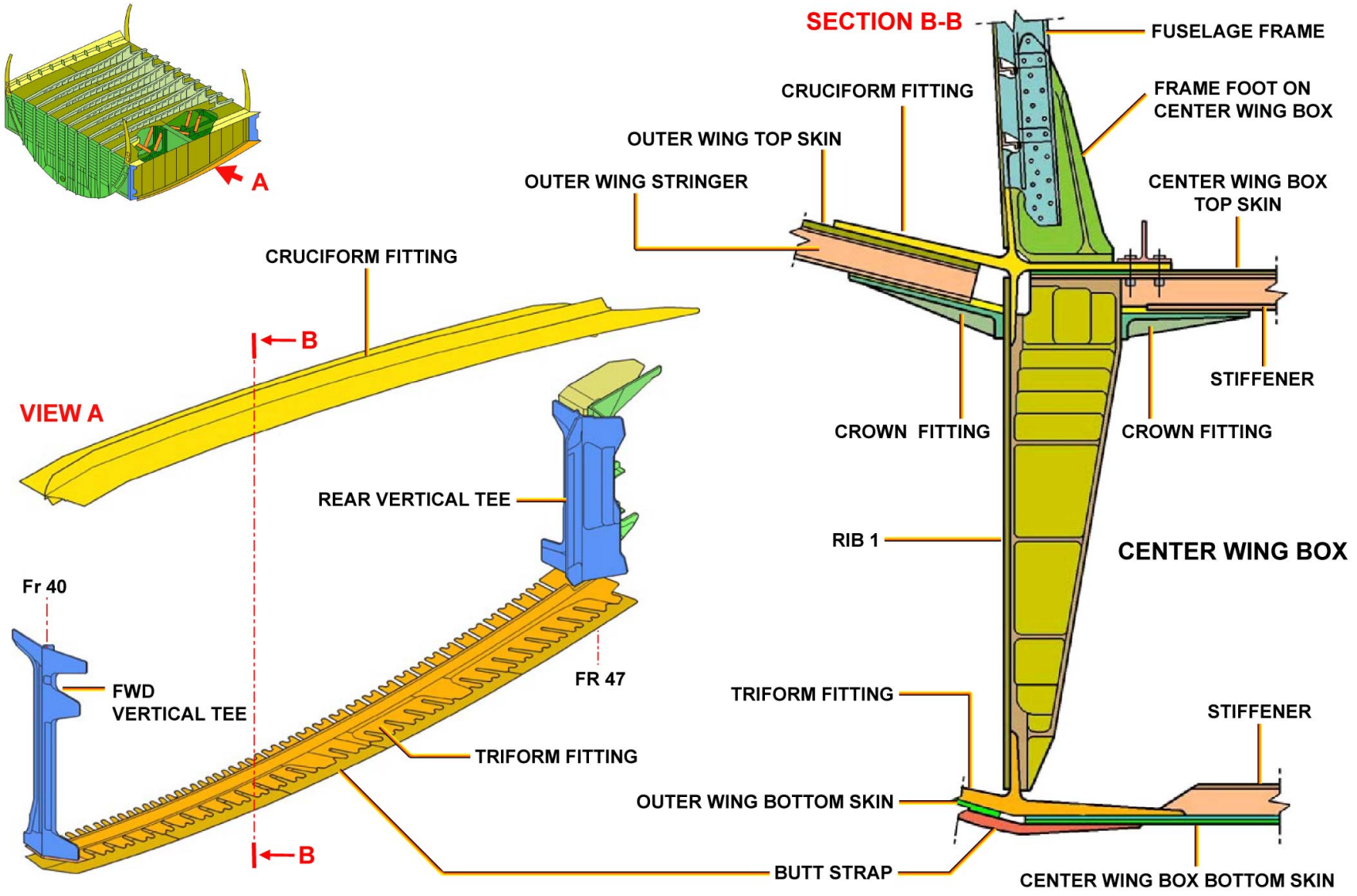
WINGS D/O (3)

CENTER WING BOX (continued)

WING ROOT JOINT

The outer wing boxes are connected to the center wing box at Rib 1.
An upper cruciform fitting makes the junction between:
- the center wing box and the outer wing box top skin panels,
- the fuselage and Rib 1.

A lower triform fitting makes the junction between center wing box panels, outer wing box bottom skin panels and Rib 1. The assembly is secured by a lower butt-strap.



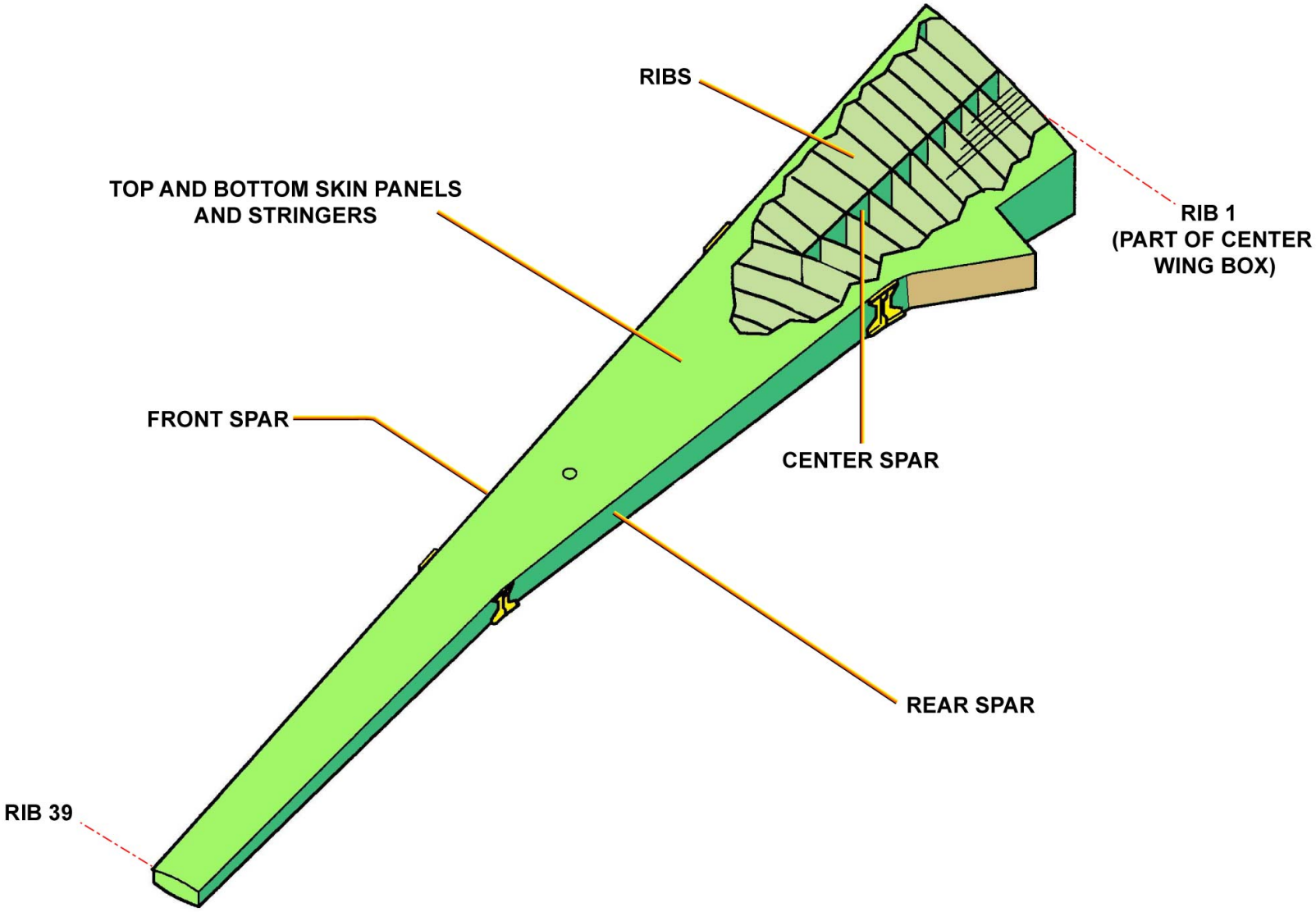
CENTER WING BOX - WING ROOT JOINT

WINGS D/O (3)

OUTER WING BOX

GENERAL ARRANGEMENT

The wing box tapers from Rib 1 (part of the center wing box) to Rib 39 includes:
- wing spars (front, center and rear),
- ribs,
- top and bottom skin panels,
- top and bottom stringers.



OUTER WING BOX - GENERAL ARRANGEMENT

WINGS D/O (3)

OUTER WING BOX (continued)

SKIN PANELS

Each outer wing box top and bottom skins include four integrally machined panels. The center skins run from the root to Rib 27. The top and bottom skin panels extend on a short distance in the front of the front spar and provide part of the attachment for the fixed leading edge structure. Behind the rear spar, the rear skin panel extends towards the aft end of the main landing gear pick-up forging, and makes the top and bottom skins of the cantilever box structure. The top and bottom skins are stiffened by machined stringer profiles. There are thirty-three openings (manholes), in the No. 2 and No. 4 bottom skin panels, which give access into the outer wing box. To get stronger bottom skin panels, these panels are made thicker in the area around the manholes (and the holes for the fuel pumps).

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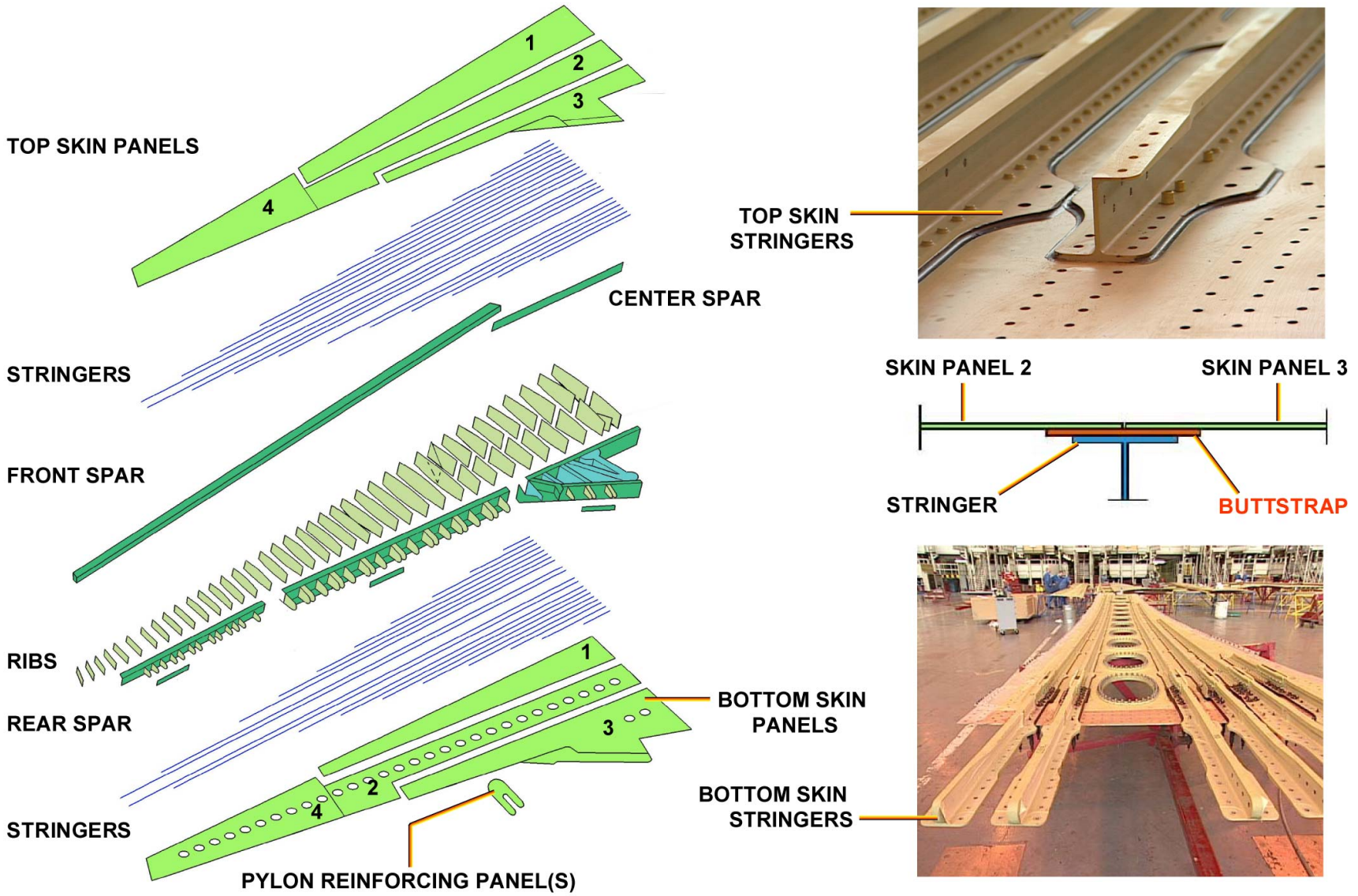


OUTER WING BOX - SKIN PANELS

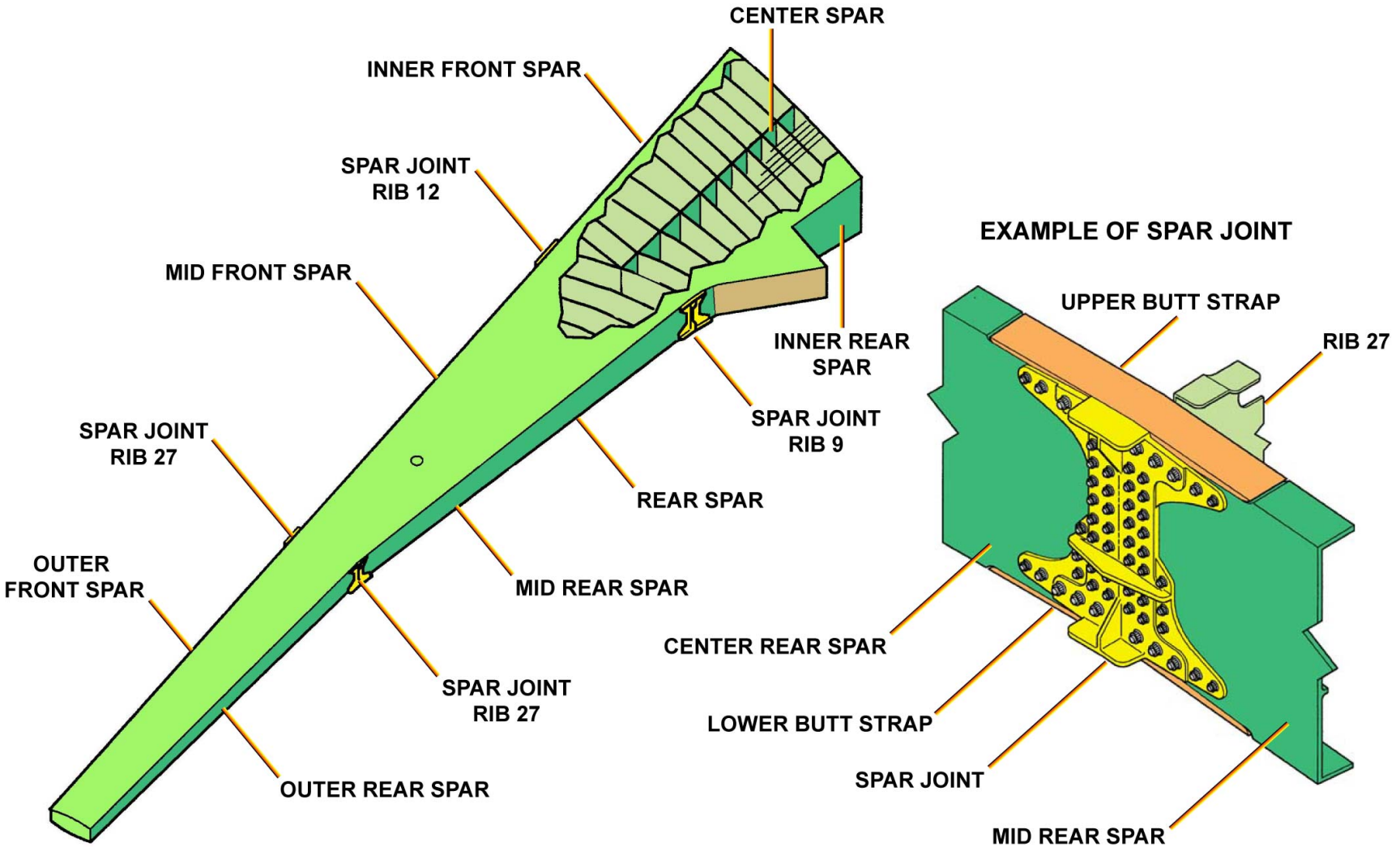
WINGS D/O (3)

OUTER WING BOX (continued)

SPARS

The wing spars are machined from aluminum alloy. They give strength to the wing box. The front and the rear spars extend from Rib 1 to Rib 39. The center spar extends from Rib 1 to outboard of Rib 11. The front and the rear spars are made of three parts (inner, mid and outer spars). Joint plates connect these spars together to make a continuous structure. The front spar joints are located at Ribs 12 and 27. The rear spar joints are located at Ribs 9 and 27.

G4J06491 - G0UT1M0 - FM51DK000000001



OUTER WING BOX - SPARS

G4J06491 - G0UT1M0 - FM51DK000000001

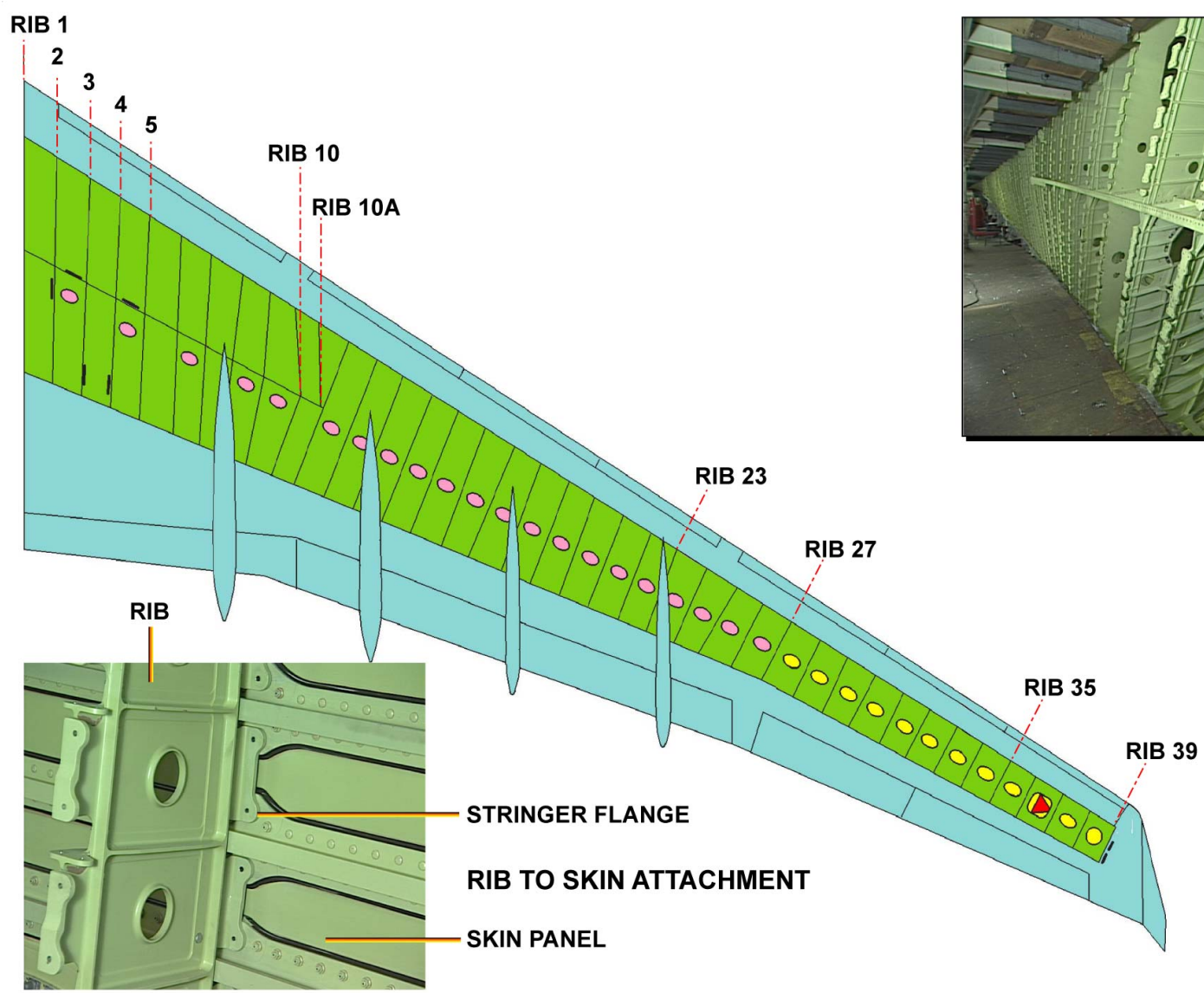
WINGS D/O (3)

OUTER WING BOX (continued)

RIBS

There are thirty-eight ribs, machined from aluminum alloy, installed in the wing box of each outer wing (Ribs 2 thru 39). The center wing-to-outer wing joint is made at Rib 1. Rib 1 is the rib that closes the center wing box.
- ribs 2 thru 11 have two parts to enable the installation of the center spar,
- and ribs 12 thru 39 are made in one part.

The ribs are attached to the skin panels and stringer flanges with bolts.



OUTER WING BOX - RIBS

WINGS D/O (3)

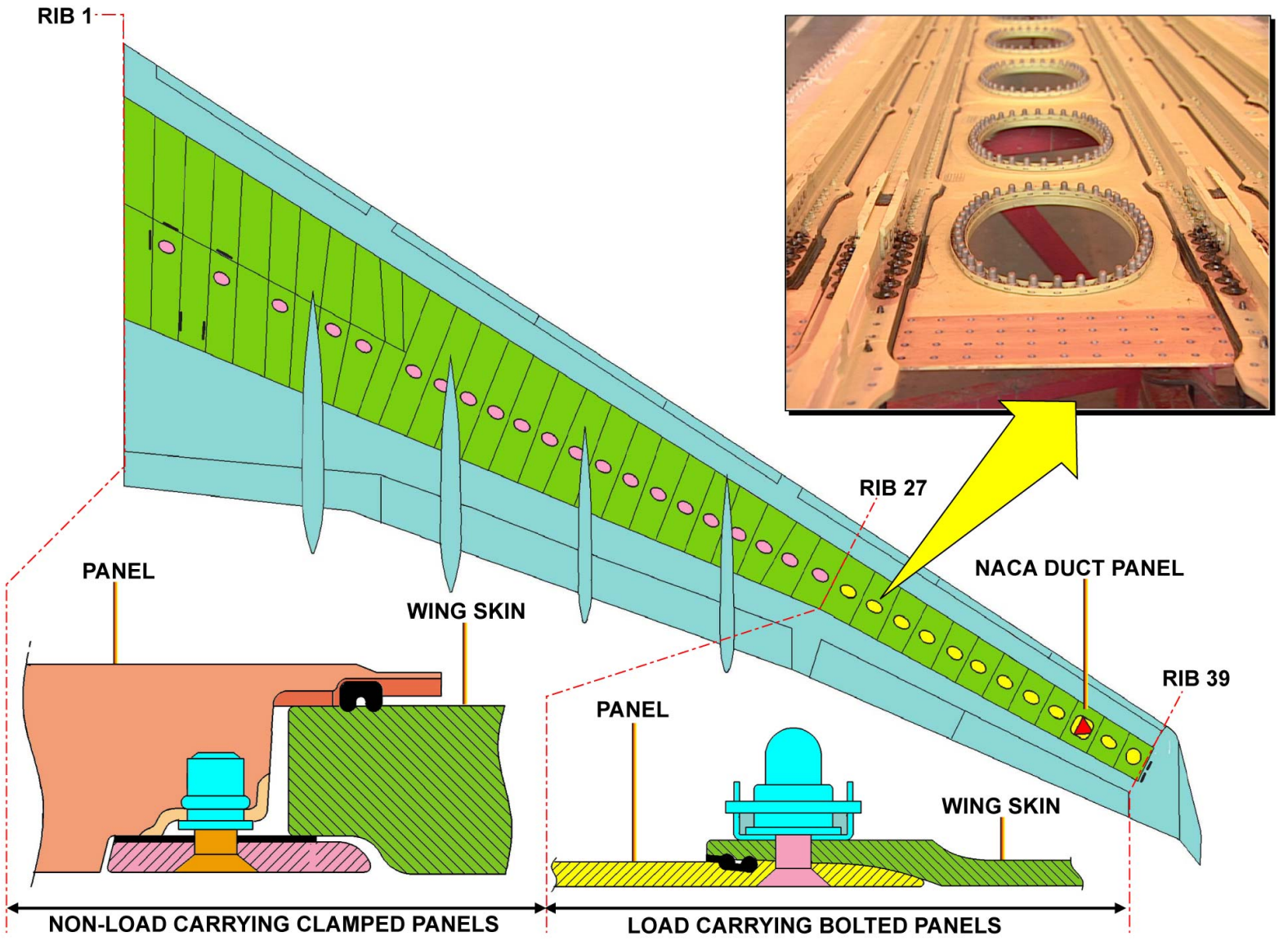
OUTER WING BOX (continued)

ACCESS HOLES / COVERS

There are thirty-three access covers (panels) installed in the bottom skin panels of the wing box. This number includes the NACA duct door and the bursting disc panel. All the panels close the openings that give access to the wing box. Bolts attach the load-carrying access panels to the bottom skin panels of the wing. Bolts and clamp rings attach the non-load carrying panels to the bottom skin panels of the wing.

There are:

- twenty-one non load-carrying access panels between Rib 1 and Rib 27,
- eleven load-carrying access panels between Rib 27 and Rib 39.



OUTER WING BOX - ACCESS HOLES / COVERS

WINGS D/O (3)

OUTER WING BOX (continued)

MAIN LANDING GEAR ATTACHMENT STRUCTURE

The Main Landing Gear (MLG) is attached to the wing box structure via the following fittings:
- the gear support rib (gear rib 6), which makes the aft attachment,
- the pintle fitting, which makes the forward attachment,
- the fitting for the side stay (side stay attachment fitting),
- the jack fitting for the MLG actuating cylinder (retraction jack fitting).

The gear support rib is machined from an aluminum alloy forging and is attached to:
- the aft face of the rear spar at Rib 6,
- the extended top and bottom wing skin panels,
- the false rear spar.

The pintle fitting is made from titanium alloy and attached at Rib 5.
The side-stay fitting is made from aluminum alloy and is attached between Rib 2 and Rib 3.

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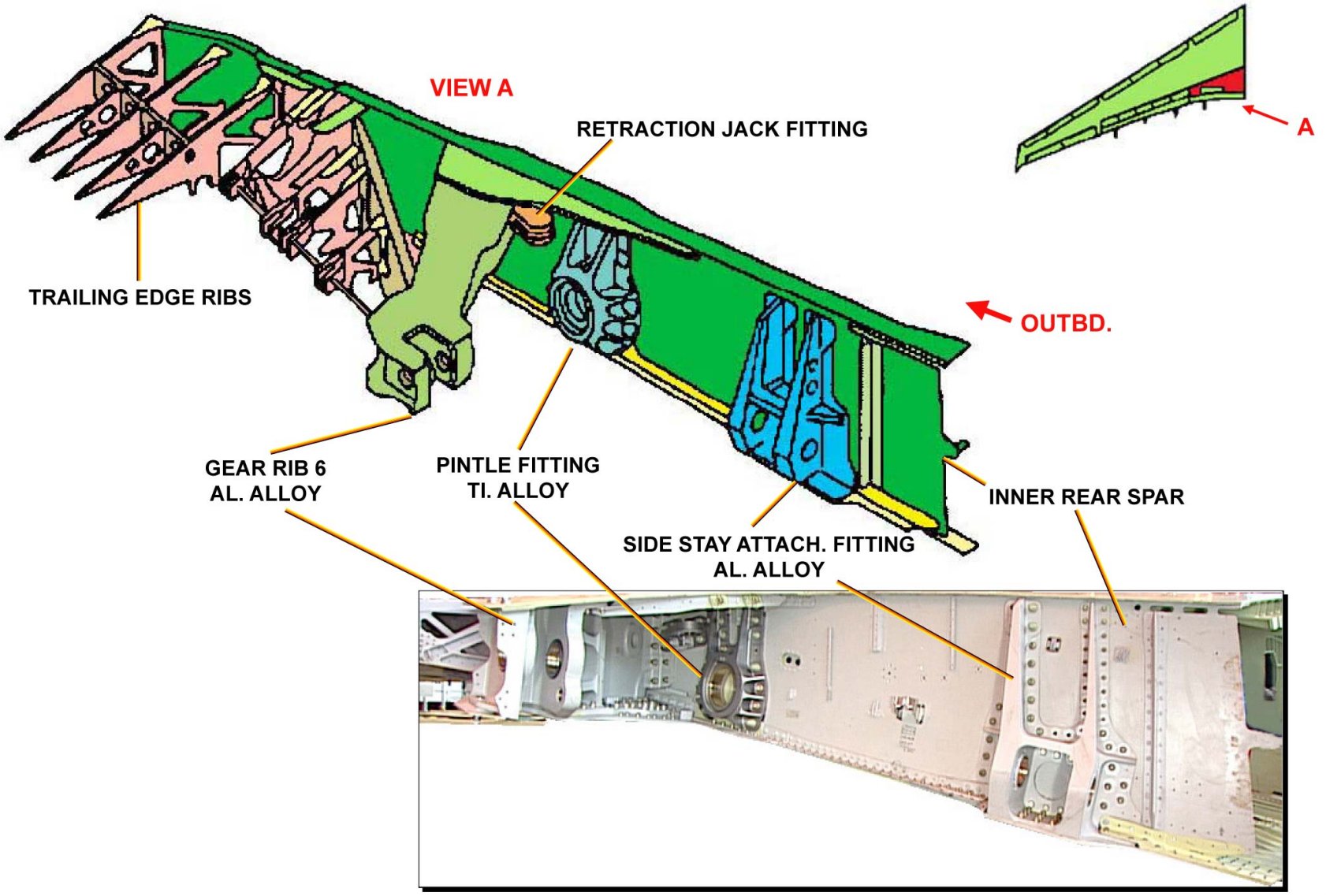

OUTER WING BOX - MAIN LANDING GEAR ATTACHMENT STRUCTURE

WINGS D/O (3)

OUTER WING BOX (continued)

PYLON ATTACHMENT STRUCTURE

There are forward and rear attachment fittings on the wing box for each engine pylon.

Forward attachment fittings are at the front spar, between Ribs 10 and 10A for the inboard pylon, and near Rib 25 for the outboard pylon (on the A340 only). The forward attachment for the pylon has a bracket assembly that absorbs the vertical loads and a thrust fitting (spigot fitting) that absorbs thrust and side loads from the engine.

The bracket assembly, made of titanium alloy, is attached to the forward face of the front spar and the top skin of the wing (the skin extends forward of the front spar).

The thrust fitting is made of titanium alloy and has a steel pin. Bolts attach the fitting to the bottom face of the bracket assembly through the reinforcing and the bottom skin.

The rear attachment fittings are located between Ribs 10 and 10A (for the inboard pylon) and at Rib 26 (for the A340 outboard pylon).

The rear attachment is a single-lug bracket.

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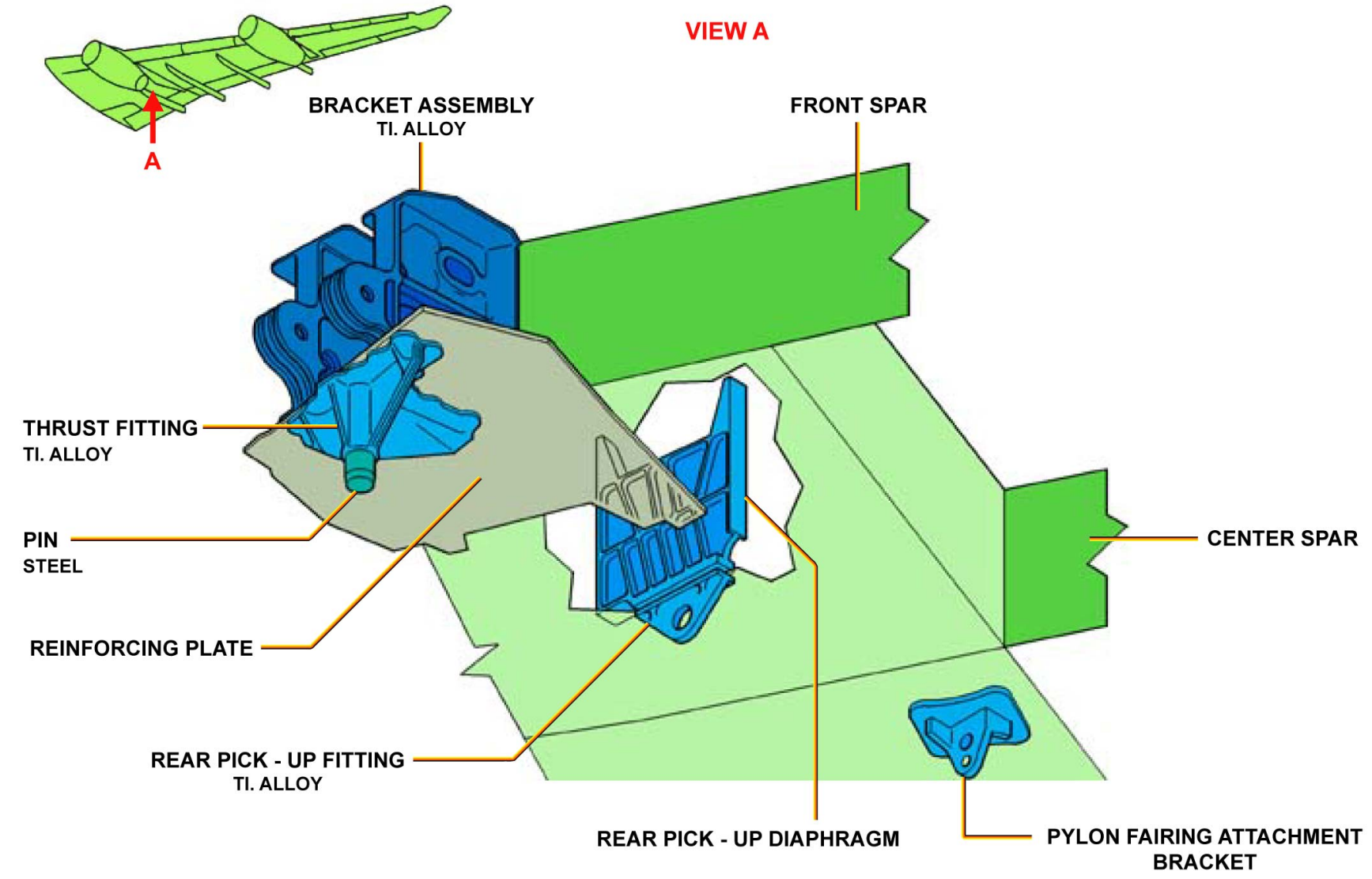


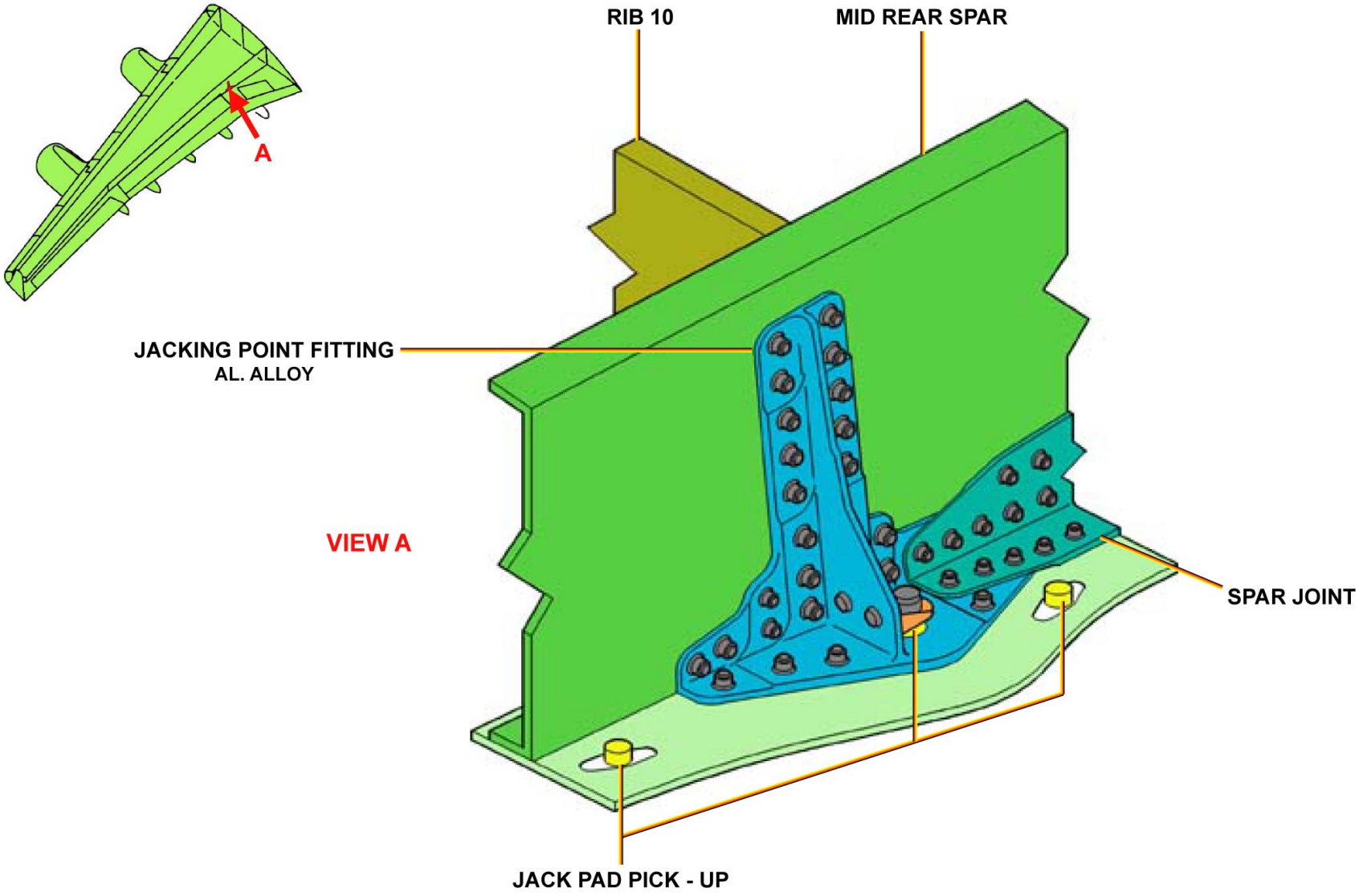
OUTER WING BOX - PYLON ATTACHMENT STRUCTURE

WINGS D/O (3)

OUTER WING BOX (continued)

JACKING POINT

A jacking point fitting is attached to the rear spar and to the outer surface of the bottom skin at Rib 10. This fitting is machined from aluminum alloy and transmits the jacking loads into the wing structure.



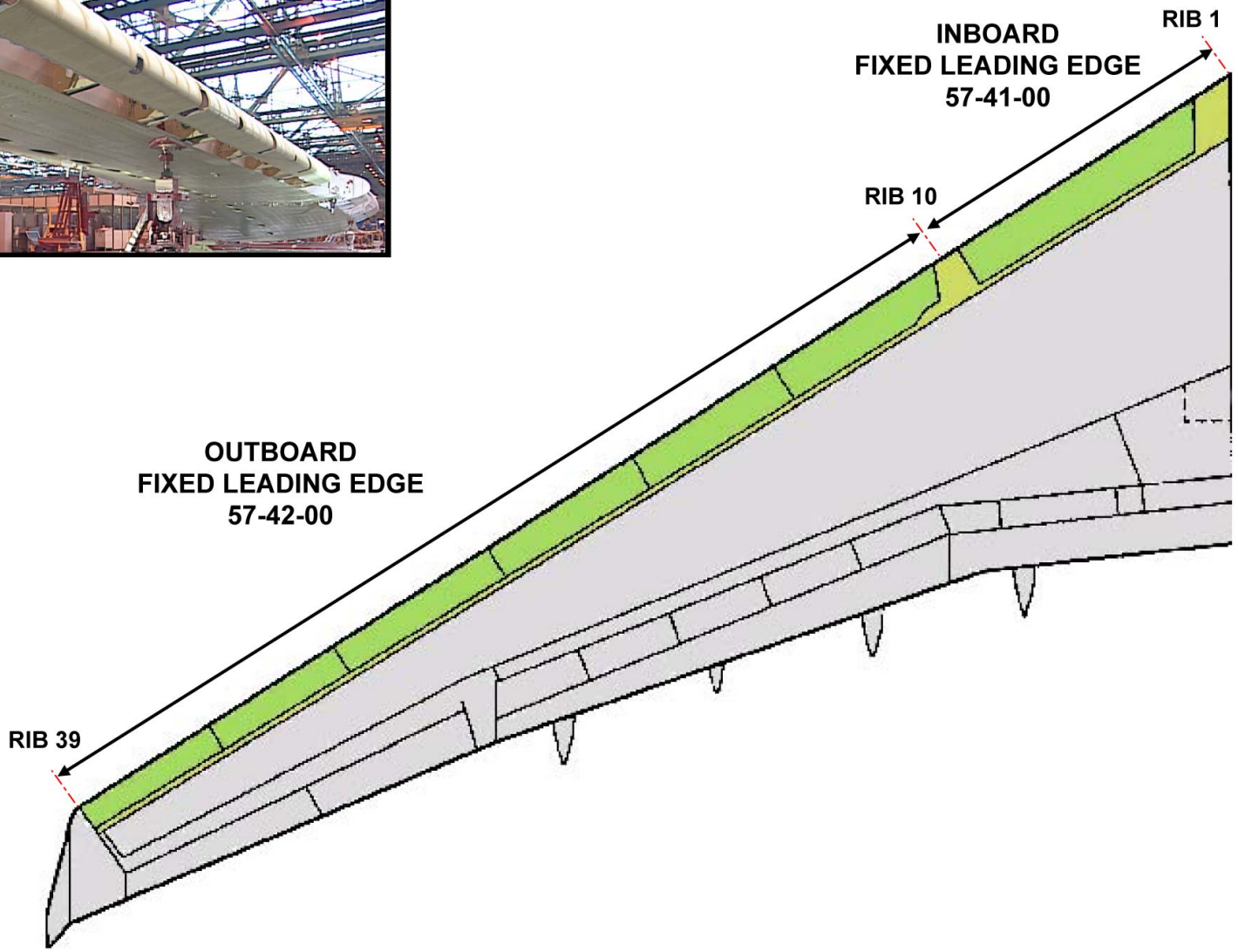
OUTER WING BOX - JACKING POINT

WINGS D/O (3)

FIXED LEADING EDGE

GENERAL ARRANGEMENT

The fixed leading edge (LE) assembly is located forward of the front spar of the wing box.
The fixed LE assembly has:
- the inboard fixed LE assembly (rib 1 to rib 10),
- and the outboard fixed LE assembly (rib 10 to rib 39).



FIXED LEADING EDGE - GENERAL ARRANGEMENT

WINGS D/O (3)

FIXED LEADING EDGE (continued)

STRUCTURE LAYOUT

The inboard and outboard fixed leading edges have the same design, which includes:
- support ribs (closing ribs, track ribs, hold-down ribs, intermediate ribs,
- top and bottom panels made of composite sandwich material (with glass fiber skins),
- the D-nose assembly.

The D-nose assembly includes:
- the outer skin (which makes the shape of the D-nose),
- the sub-spar (which makes the aft face of the D-nose),
- the riblets (which are attached to the inside of the D-nose to strengthen the structure).

There are cutouts in the bottom half of the D-nose assembly at the slat track position.

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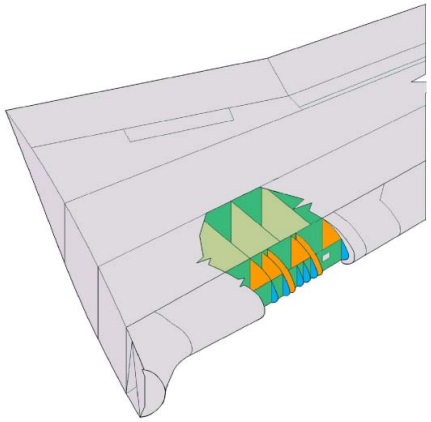

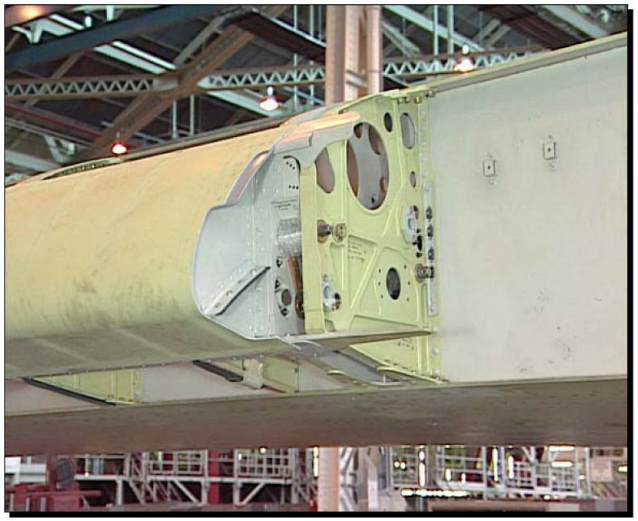

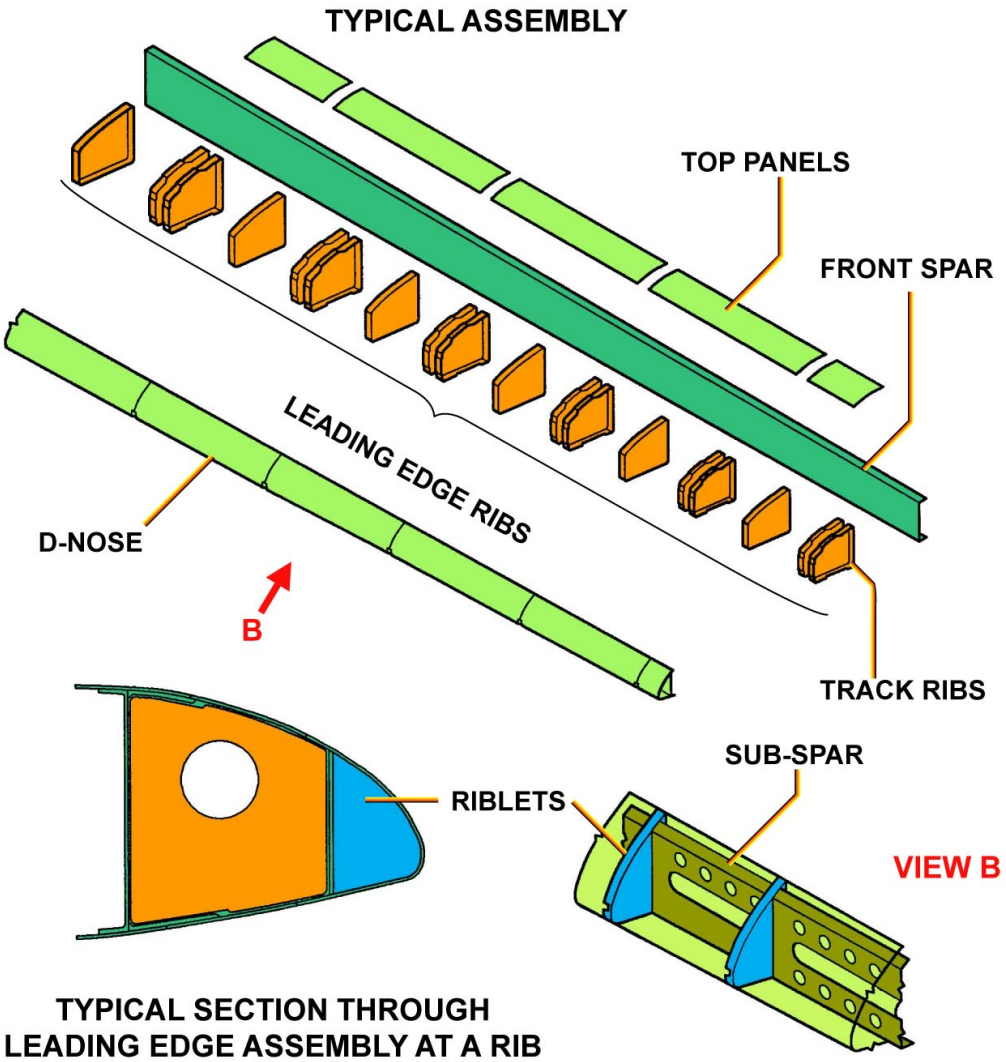

FIXED LEADING EDGE - STRUCTURE LAYOUT

WINGS D/O (3)

SLATS

GENERAL ARRANGEMENT

The wing leading edge is fitted with seven slats. Slats 4 to 7 are de-iced. The hot air comes from the bleed air system and is supplied to Slat 4 through a telescopic duct and piccolo tubes, installed in the leading edges of the slats.

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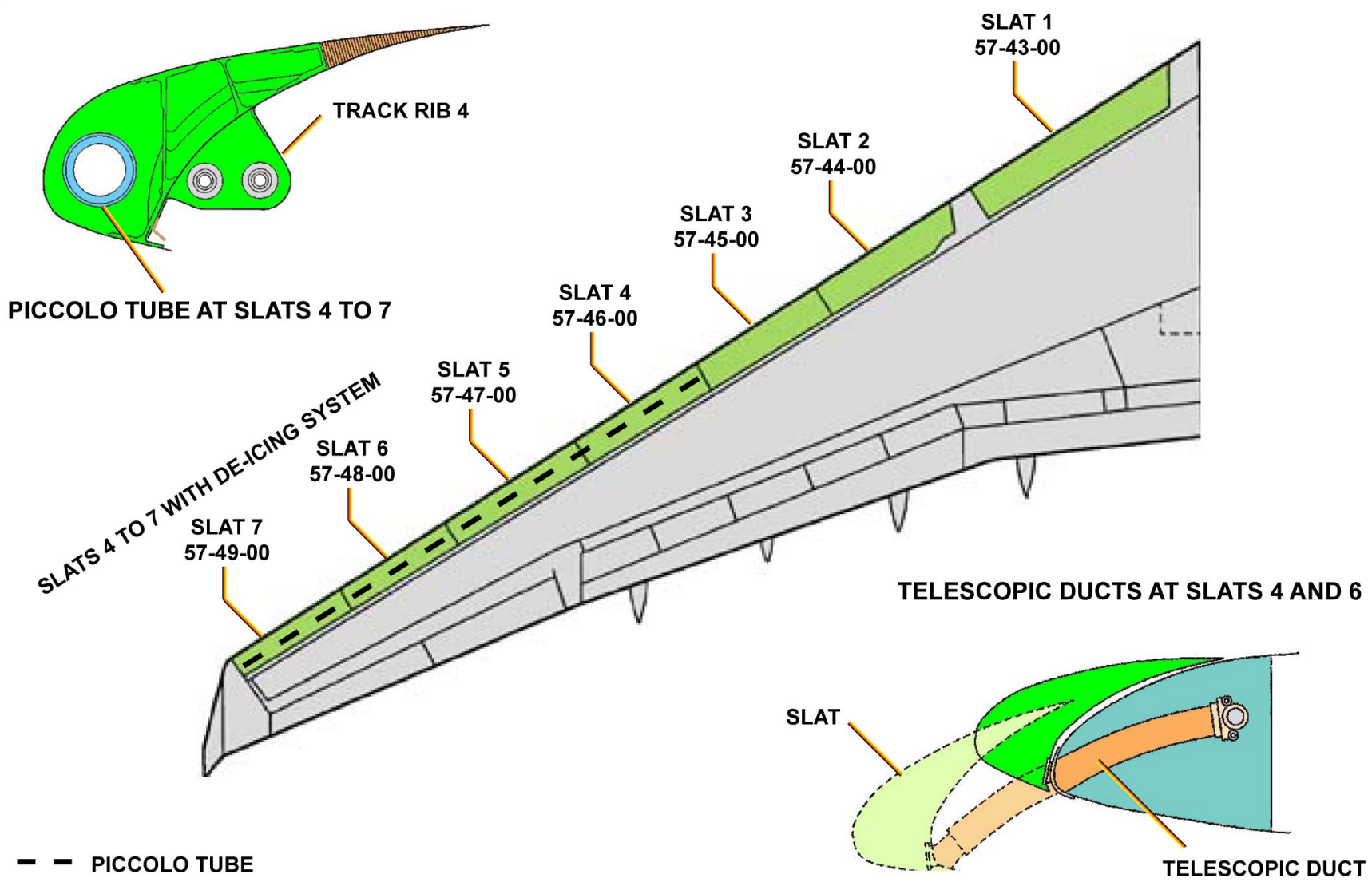

SLATS - GENERAL ARRANGEMENT

G4J06491 - G0UT1M0 - FM51DK000000001

WINGS D/O (3)

SLATS (continued)

STRUCTURE LAYOUT

Slat 1 is supported by 4 tracks, two of them being driven (track 2 and 3). Slats 2 to 7 are supported by two tracks, both being driven.

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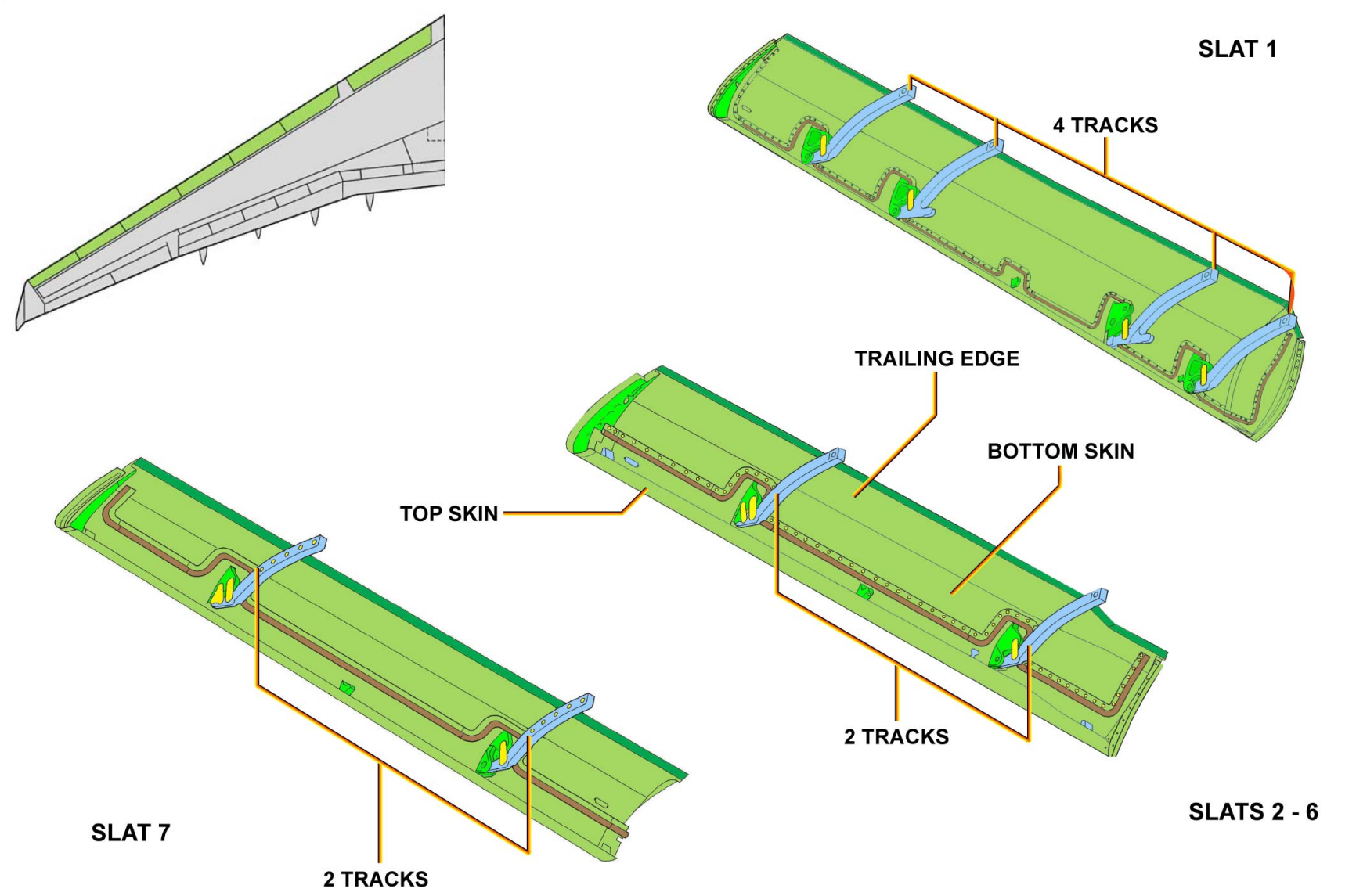


SLATS - STRUCTURE LAYOUT

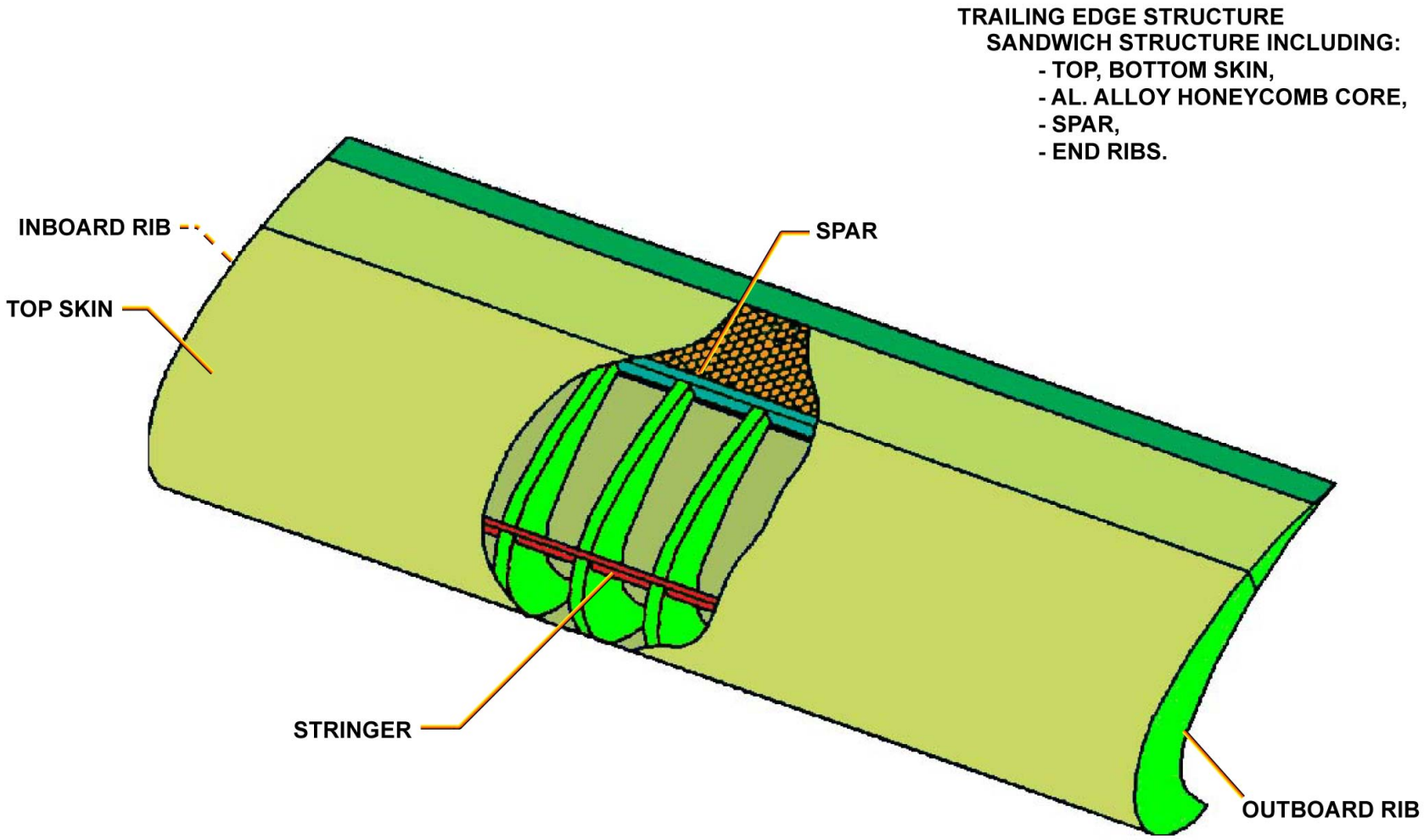
WINGS D/O (3)

SLATS (continued)

TYPICAL CONSTRUCTION

Each leading edge slat includes:
- a front spar (for slats 4 to 7) or stringer(s) (for slat 1, 2 and 3),
- a rear spar,
- ribs,
- top and bottom skins with trailing edge assembly.

All these parts (except for the trailing edge assembly) are made of aluminum alloy. The trailing edge assembly is made from aluminum with a honeycomb core, and has a trailing edge extrusion of aluminum alloy. Because the slats 4 thru 7 have an ice protection system, some of the structure is made from a heat resistant alloy.



SLATS - TYPICAL CONSTRUCTION

WINGS D/O (3)

FIXED TRAILING EDGE

GENERAL ARRANGEMENT

The fixed trailing edge is that part of the wing structure which is aft of the wing rear spar. It is divided into three sections:
- the inner rear spar trailing edge from Rib 1 to Rib 9,
- the mid rear spar trailing edge from Rib 12 to Rib 27,
- and the outer rear spar trailing edge from Rib 27 to Rib 41.

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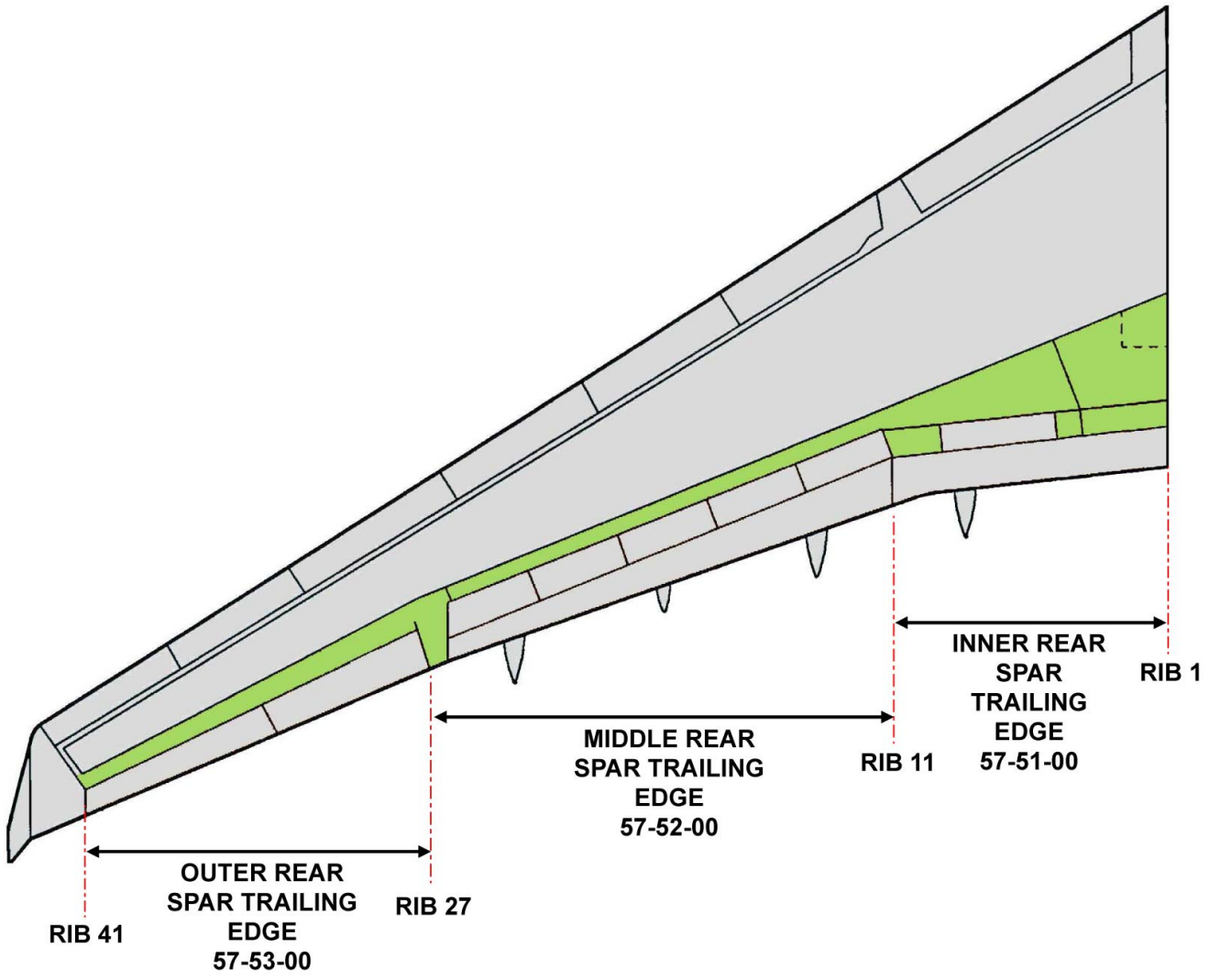


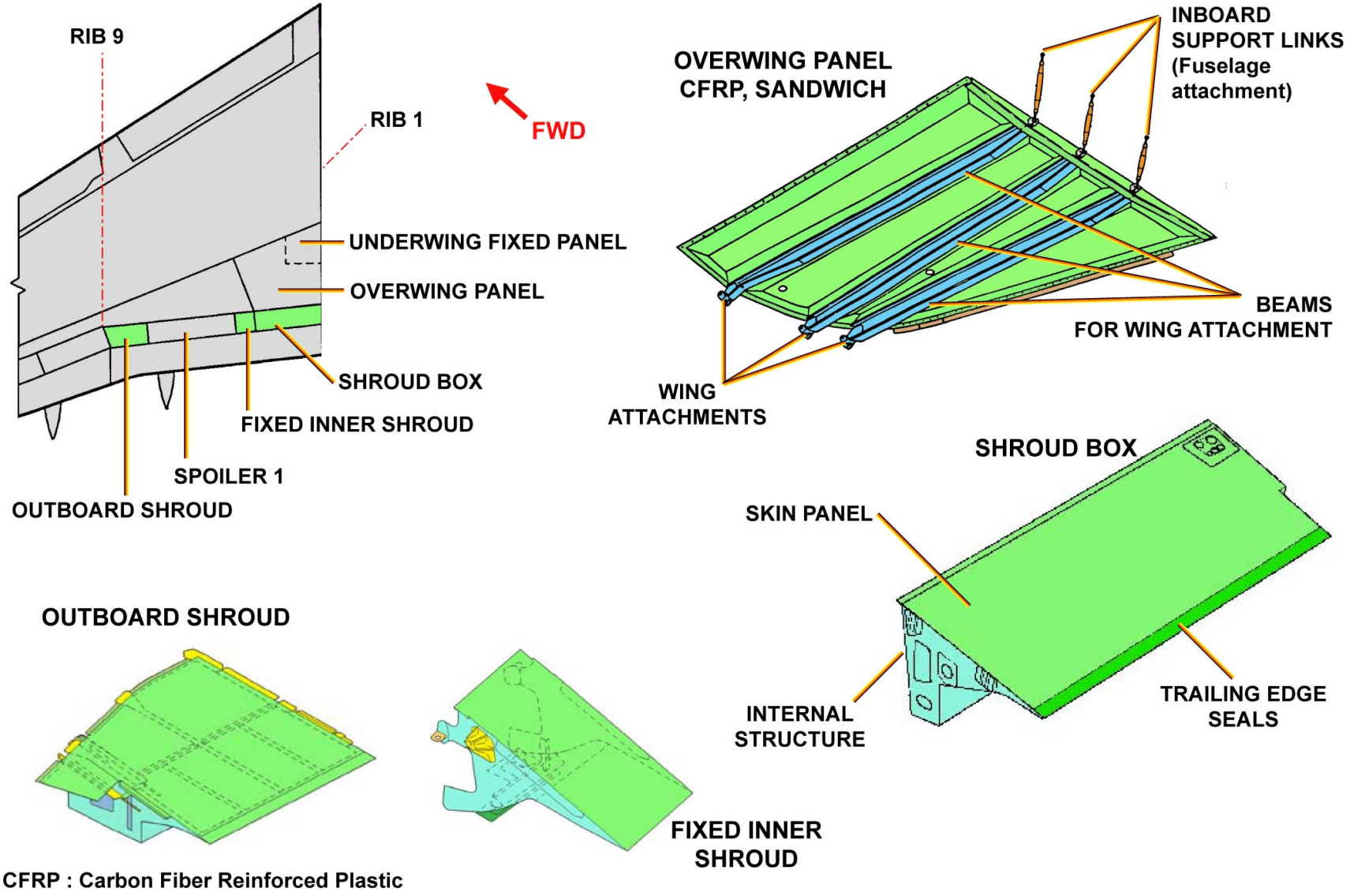
FIXED TRAILING EDGE - GENERAL ARRANGEMENT

WINGS D/O (3)

FIXED TRAILING EDGE (continued)

INNER REAR SPAR FIXED TRAILING EDGE

The structure of the inner spar fixed trailing edge includes:
- the shroud box,
- the overwing panel,
- the fixed inner shroud,
- the outboard shroud,
- the underwing fixed panel.



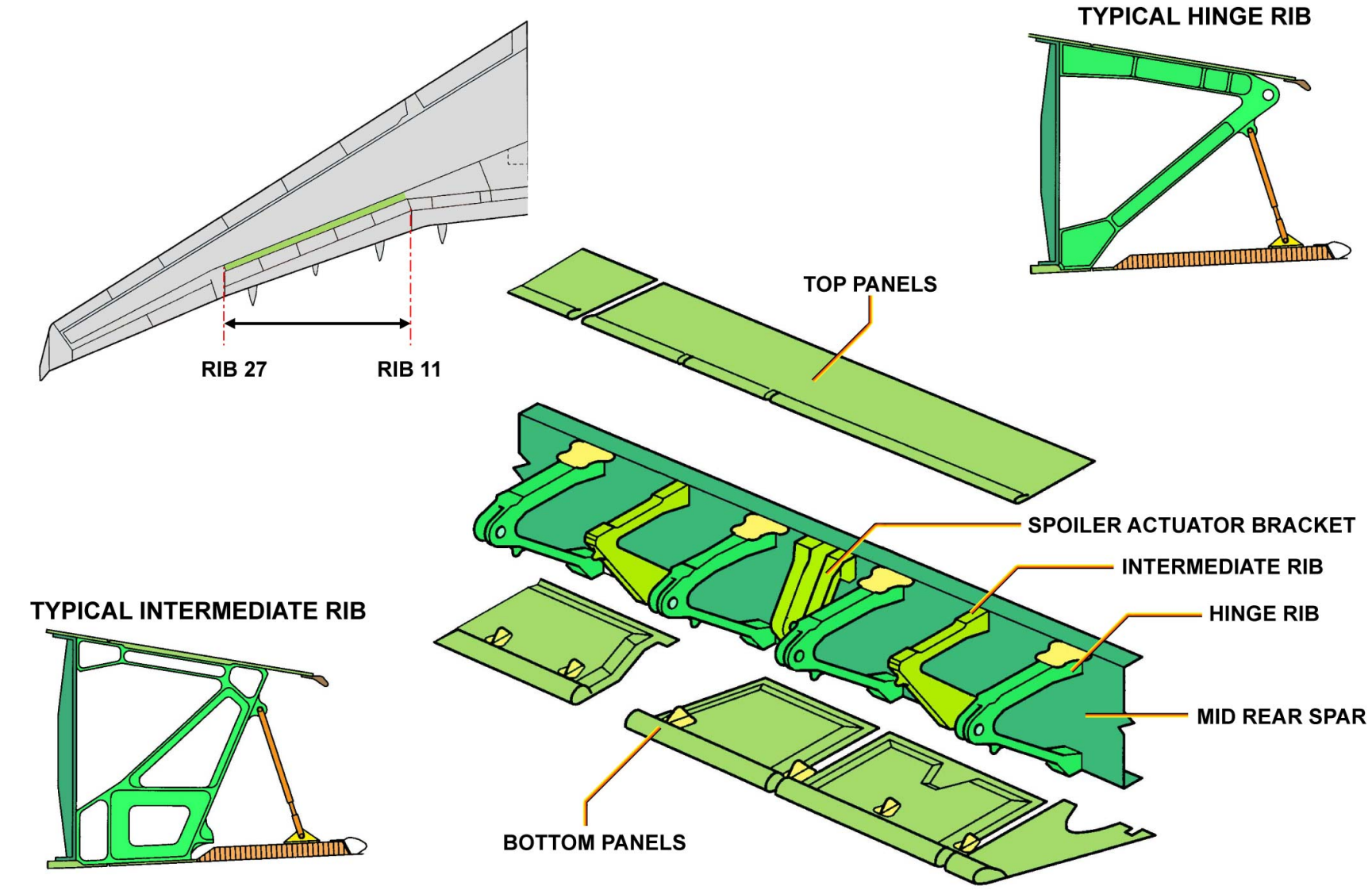
FIXED TRAILING EDGE - INNER REAR SPAR FIXED TRAILING EDGE

WINGS D/O (3)

FIXED TRAILING EDGE (continued)

MID REAR SPAR FIXED TRAILING EDGE

The mid rear spar fixed trailing edge structure includes:
- spoiler hinge ribs,
- common hinge ribs,
- intermediate ribs,
- spoiler actuator brackets,
- top and bottom panels.



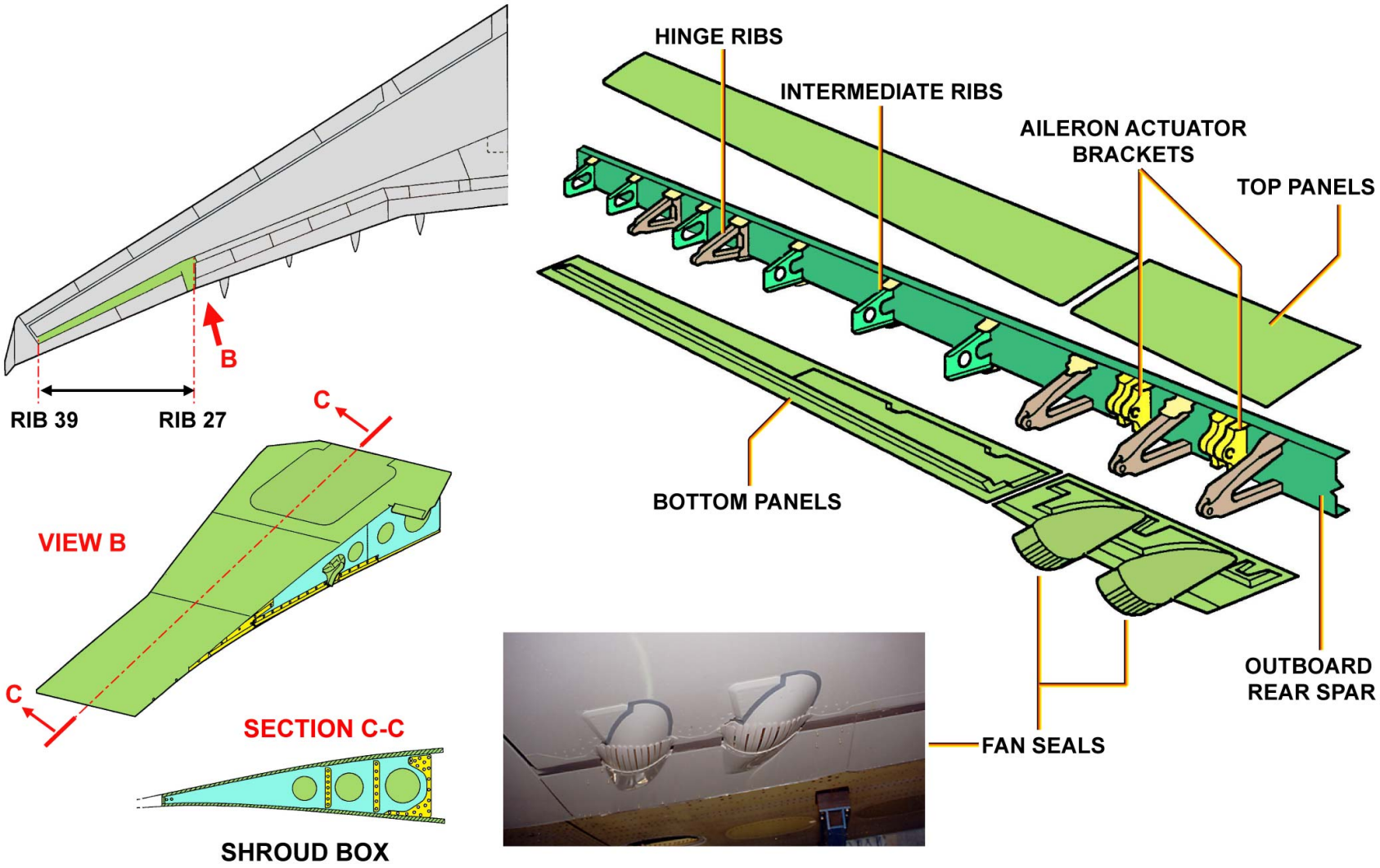
FIXED TRAILING EDGE - MID REAR SPAR FIXED TRAILING EDGE

WINGS D/O (3)

FIXED TRAILING EDGE (continued)

OUTER REAR SPAR FIXED TRAILING EDGE

The outer rear spar fixed trailing edge structure includes:
- aileron hinge ribs,
- intermediate ribs,
- one closing rib,
- aileron actuator brackets,
- top and bottom panels.



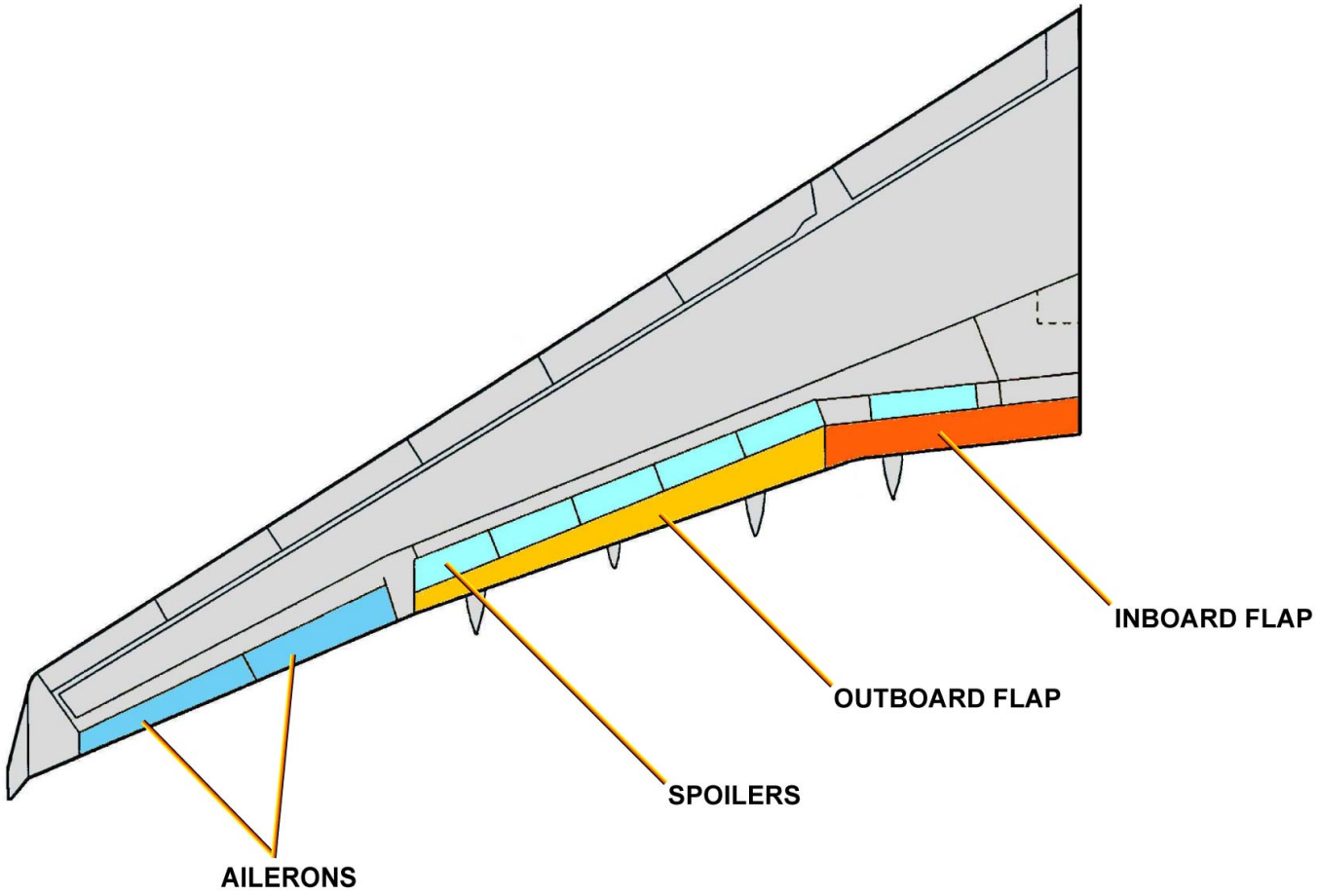
FIXED TRAILING EDGE - OUTER REAR SPAR FIXED TRAILING EDGE

WINGS D/O (3)

TRAILING EDGE DEVICES

GENERAL ARRANGEMENT

The Trailing Edge (TE) movable surfaces are:
- the inboard and outboard flaps,
- the two ailerons,
- and the six spoilers.



TRAILING EDGE DEVICES - GENERAL ARRANGEMENT

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

FLAPS - GENERAL ARRANGEMENT

Two single-element flaps are installed on the TE of the outer wing.
An interconnection strut connects the inboard flap to the outboard flap. In case of a drive station failure, this device carries the loads.
The inboard flap is installed between Rib 1 and Rib 11. It is supported by an assembly attached to the fuselage (track 1) and another support assembly below the wing (track 2).
The outboard flap is installed between Ribs 11 and 27 and is supported by three assemblies below the wing (tracks 3 to 5).

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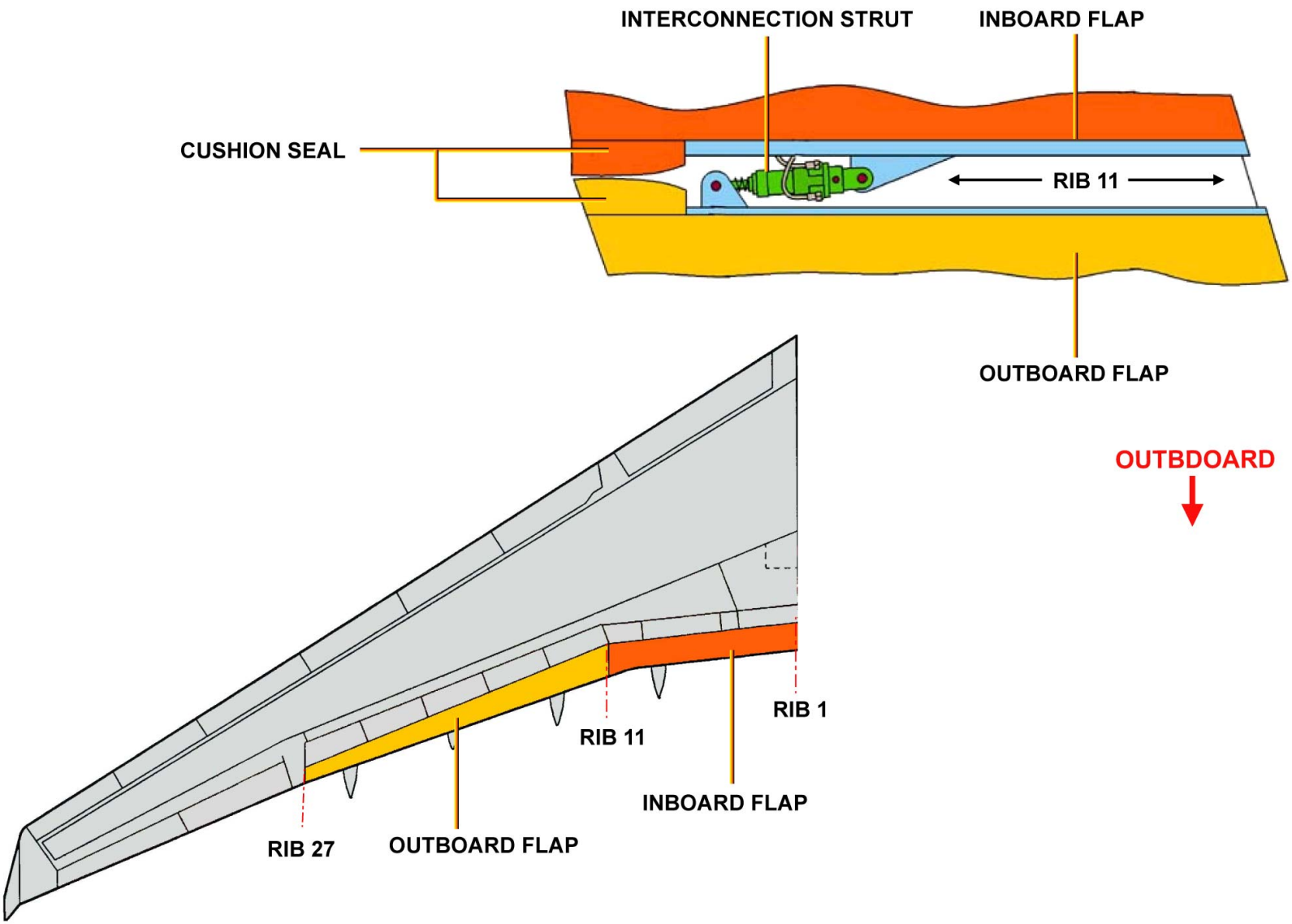


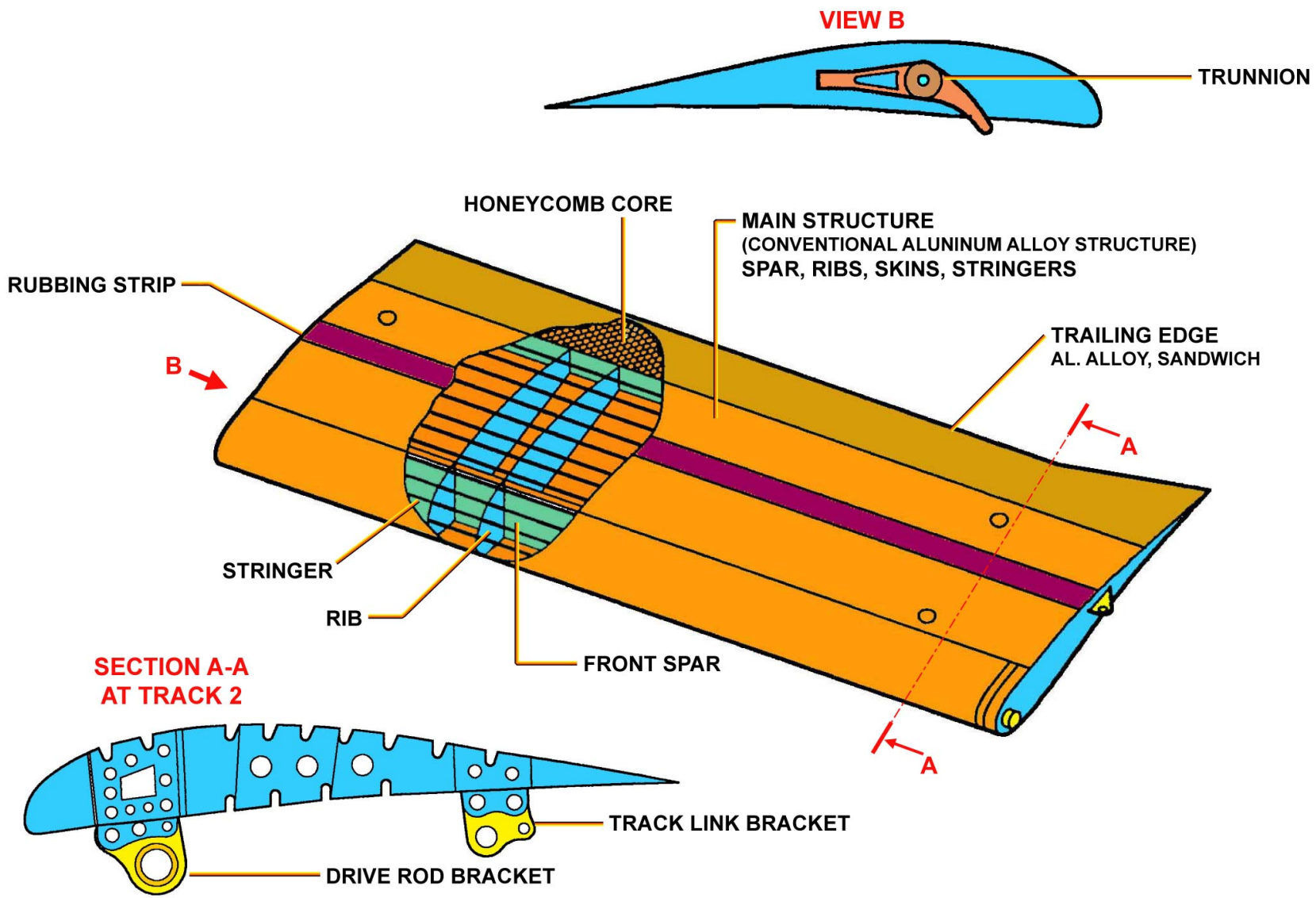
TRAILING EDGE DEVICES - FLAPS - GENERAL ARRANGEMENT

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

INBOARD FLAP STRUCTURE (METALLIC DESIGN)

The inboard flap is supported by a fuselage track and carriage (track 1) and one wing tack and carriage (track 2). Both are driven.
It is of classical aluminum alloy construction, with an aluminum sandwich trailing edge. A rubbing strip made of stainless steel is bonded to the outer surface of the top skin. A steel trunnion titanium casting is attached to the inboard end of the flap.



TRAILING EDGE DEVICES - INBOARD FLAP STRUCTURE (METALLIC DESIGN)

G4J06491 - G0UT1M0 - FM51DK000000001

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

OUTBOARD FLAP STRUCTURE (CFRP DESIGN)

The outboard flap is supported by three wing tracks and carriages (tracks 3, 4, 5). All tracks are driven. The outer flap has a main box structure, a carbon fiber leading edge and a segmented aluminum sandwich trailing edge.

The main box structure includes:

- a top and a bottom skin panels stiffened by integrated stringers, both made of solid laminate carbon fiber,
- ribs, made of solid laminate carbon fiber, except in load introduction areas, were machined aluminum ribs are used (end ribs and track ribs),
- solid laminate carbon fiber spars.

A rubbing strip made of stainless steel is bonded onto the outer surface of the top skin.

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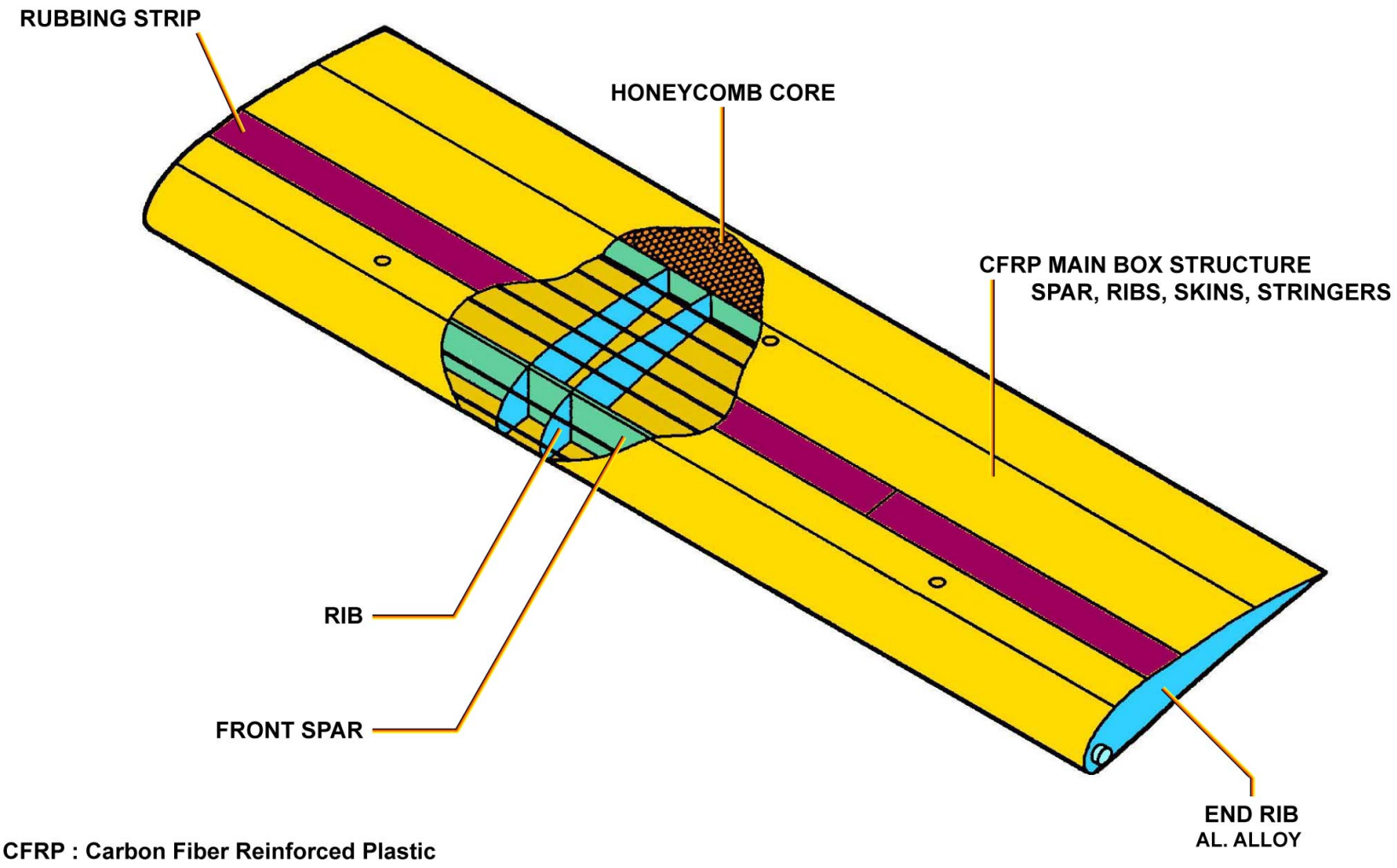

CFRP : Carbon Fiber Reinforced Plastic

TRAILING EDGE DEVICES - OUTBOARD FLAP STRUCTURE (CFRP DESIGN)

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

OUTBOARD FLAP RIBS

The outboard flap ribs structure is detailed in the following illustration.

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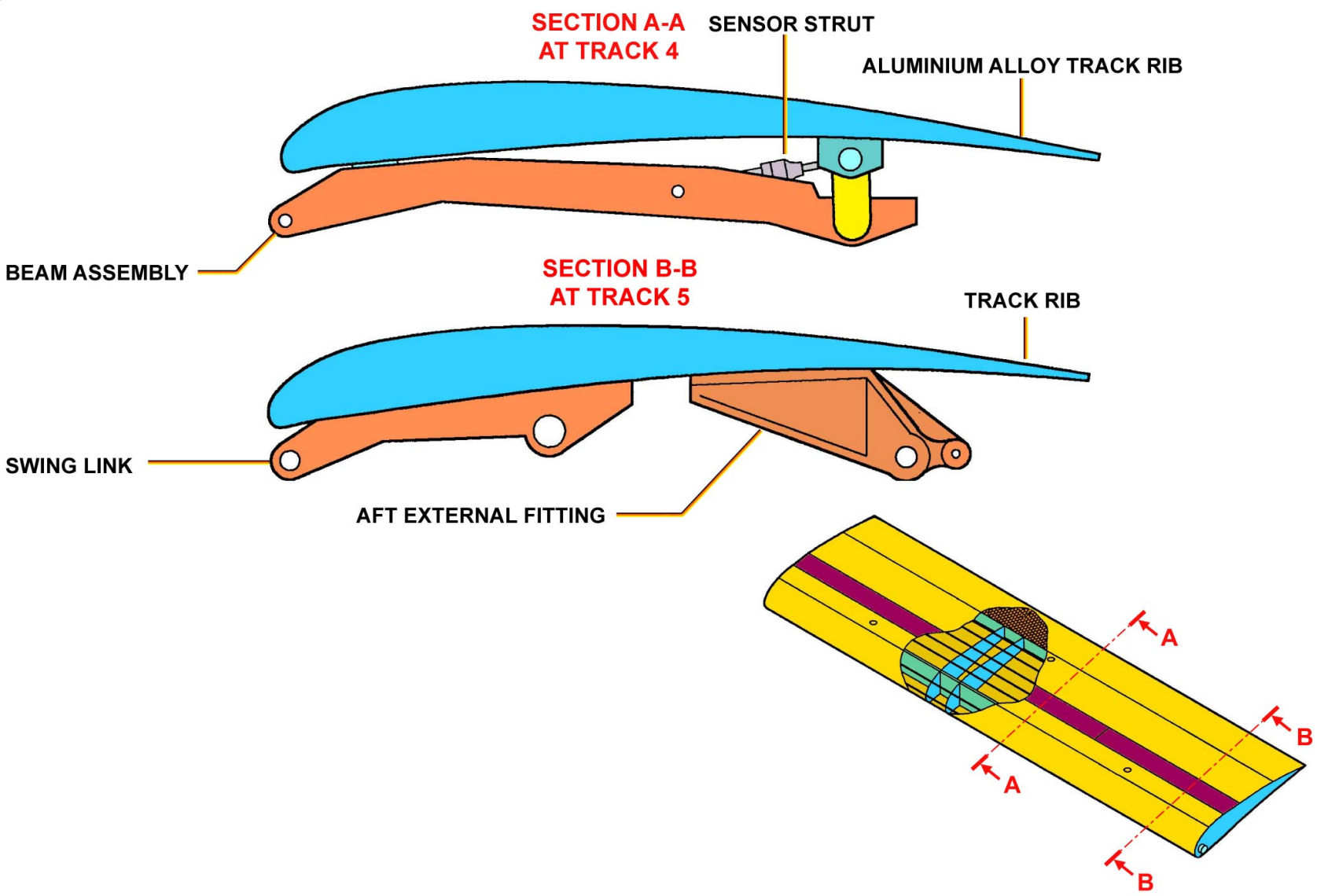

TRAILING EDGE DEVICES - OUTBOARD FLAP RIBS

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

SPOILERS - GENERAL ARRANGEMENT

There are six spoilers installed in the upper surface of the trailing edge of each wing. Hinges attach each spoiler to the rear spar or the false rear spar. The spoiler actuators are installed between the actuator attachment fittings and the rear spar, or the false rear spar of the wing box.

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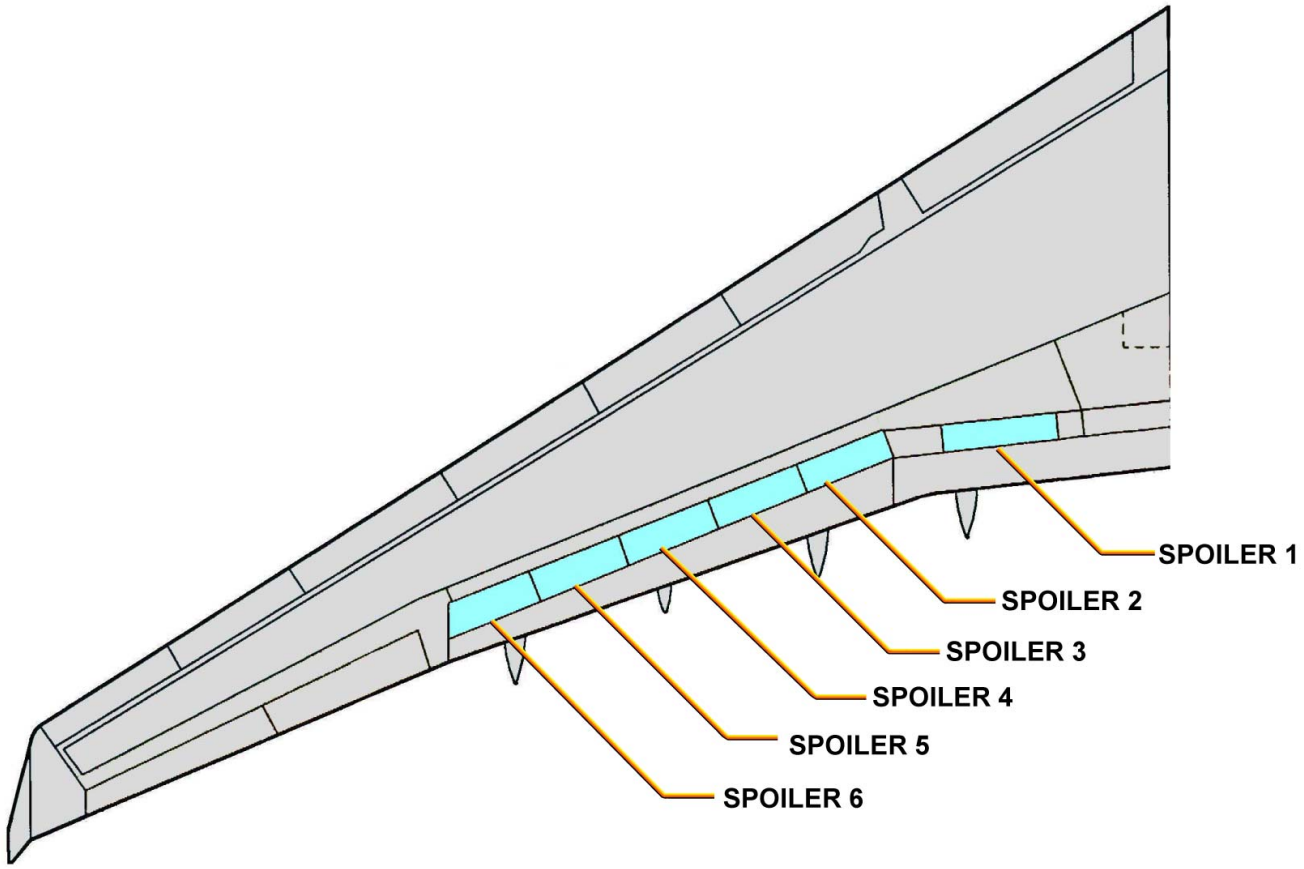


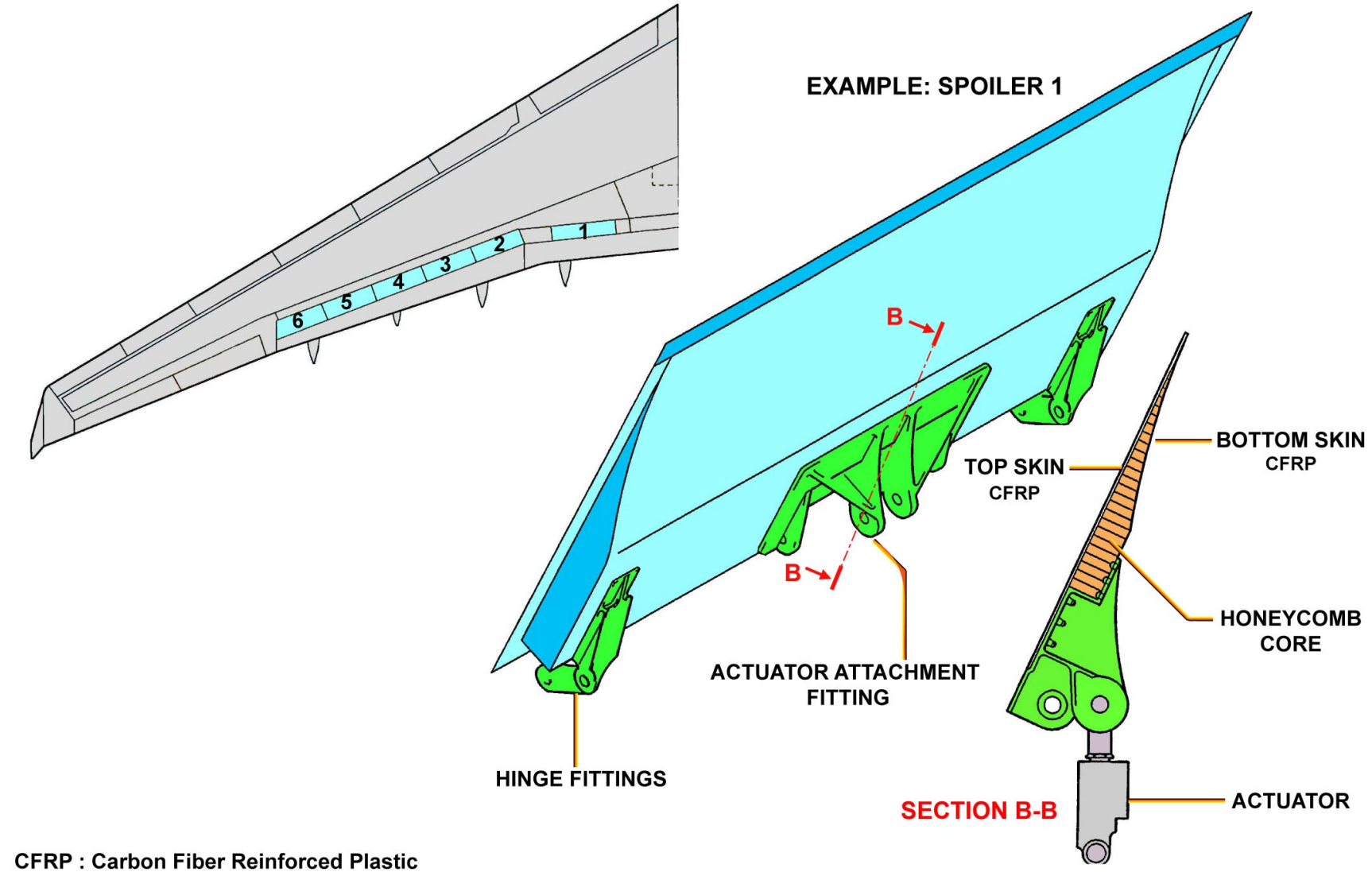
TRAILING EDGE DEVICES - SPOILERS - GENERAL ARRANGEMENT

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

SPOILERS - STRUCTURE LAYOUT

The spoilers have a wedge-shaped structure. Top and bottom skins are made of carbon fiber. They are bonded to a honeycomb core. The spoiler hinges and the spoiler actuator attachment-fittings are made of aluminum alloy.



TRAILING EDGE DEVICES - SPOILERS - STRUCTURE LAYOUT

WINGS D/O (3)

TRAILING EDGE DEVICES (continued)

AILERONS - STRUCTURE LAYOUT

The ailerons are located at the end of the wings between Rib 39 and Rib 33 for the outboard aileron, and between Rib 33 and Rib 27 for the inboard aileron. The box structure has the following parts:
- a lower and an upper Carbon Fiber Reinforced Plastic (CFRP) sandwich panel, with monolithic areas at the rib and spar attachments,
- a spar assembly made in two parts (a mechanically-machined titanium part and a CFRP part),
- and ribs assemblies (made of CFRP).

There are five hinge fittings and two actuator attachment fittings. They are attached to the spar web and to the spar booms and skins. The leading edge panels are attached to the skin panel rebates.

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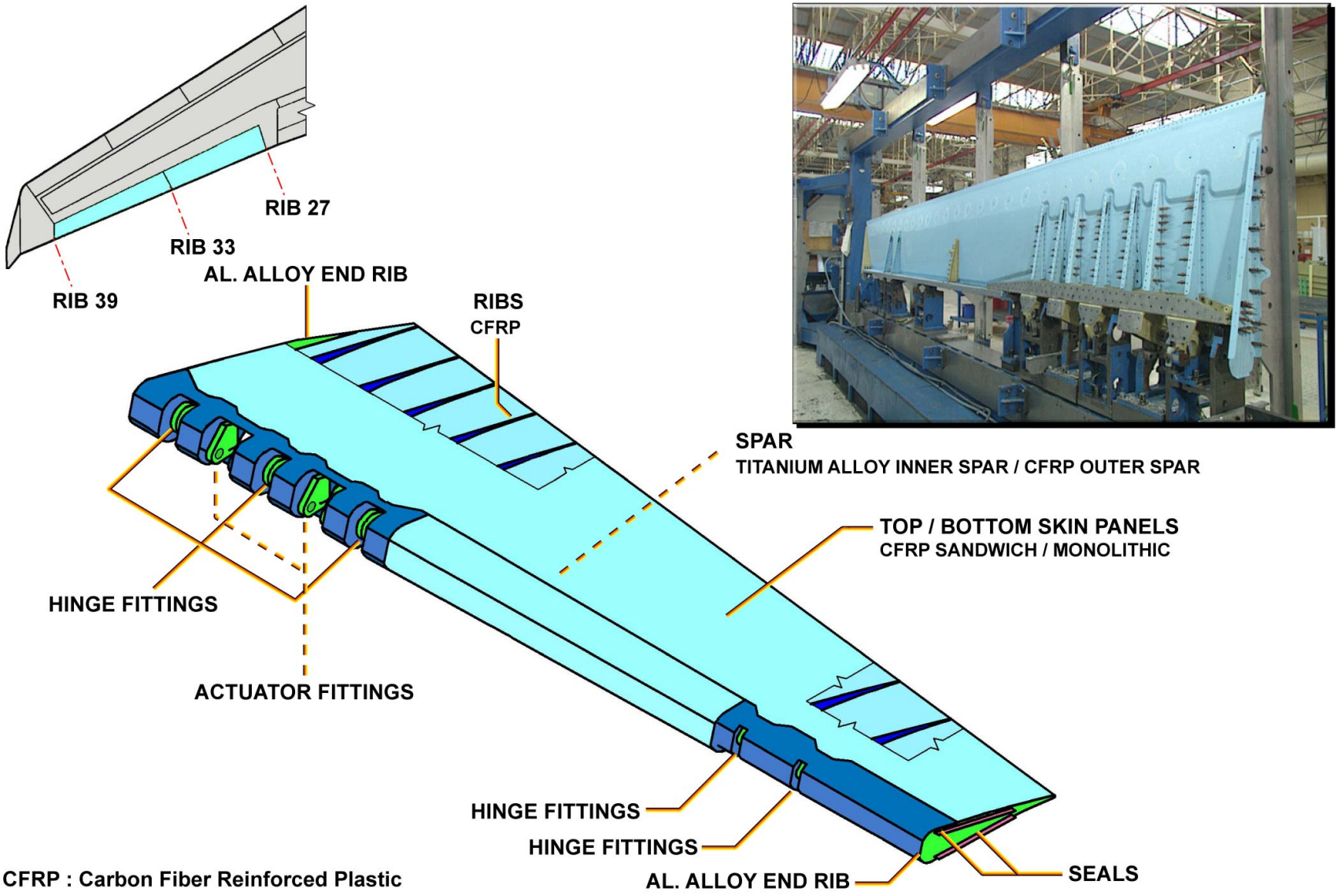
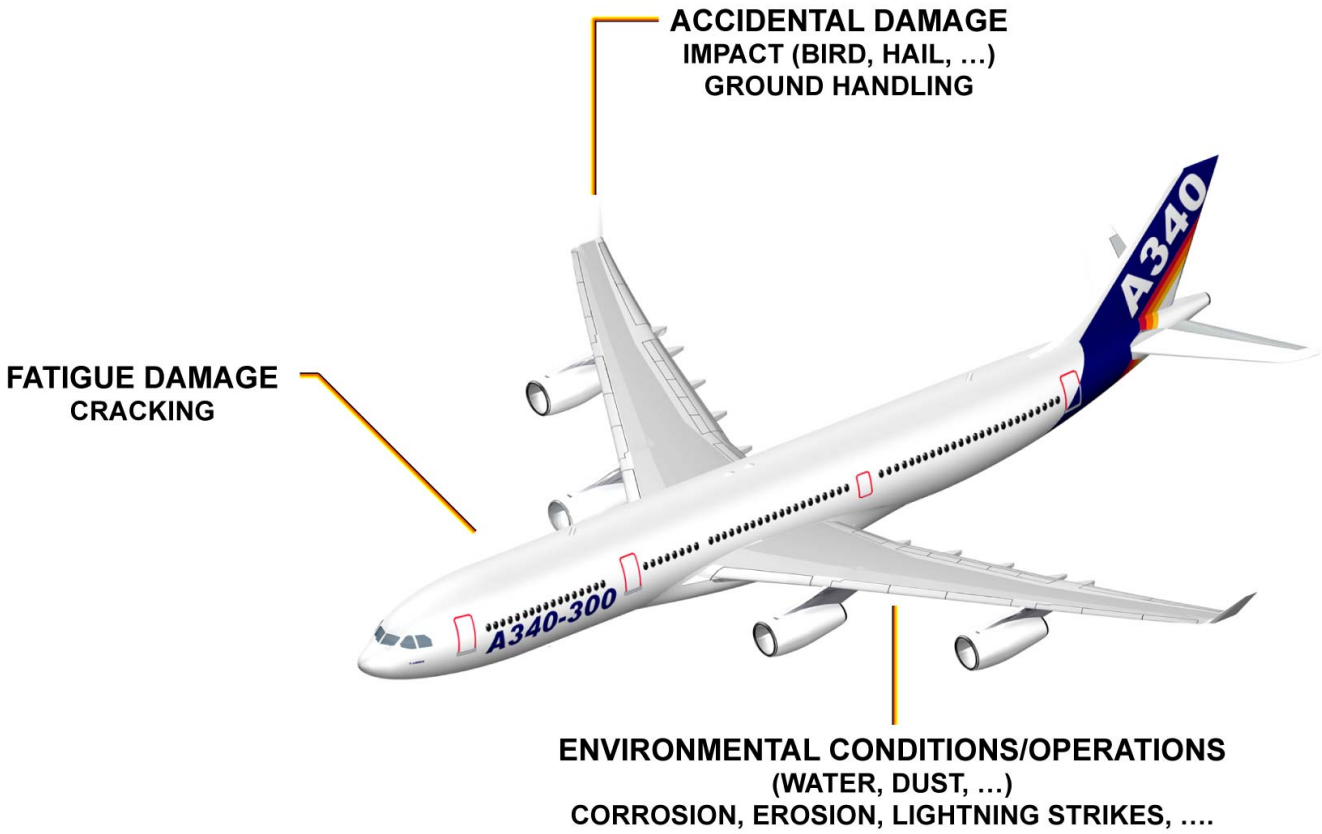


TRAILING EDGE DEVICES - AILERONS - STRUCTURE LAYOUT

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SOURCES OF DAMAGE

Throughout its operational life the aircraft structure is subjected to different types of damage: fatigue damage (cracking), accidental damage (e.g. bird impact, ground handling...), deteriorations due to environmental and operating conditions (lightning strike, corrosion ...).



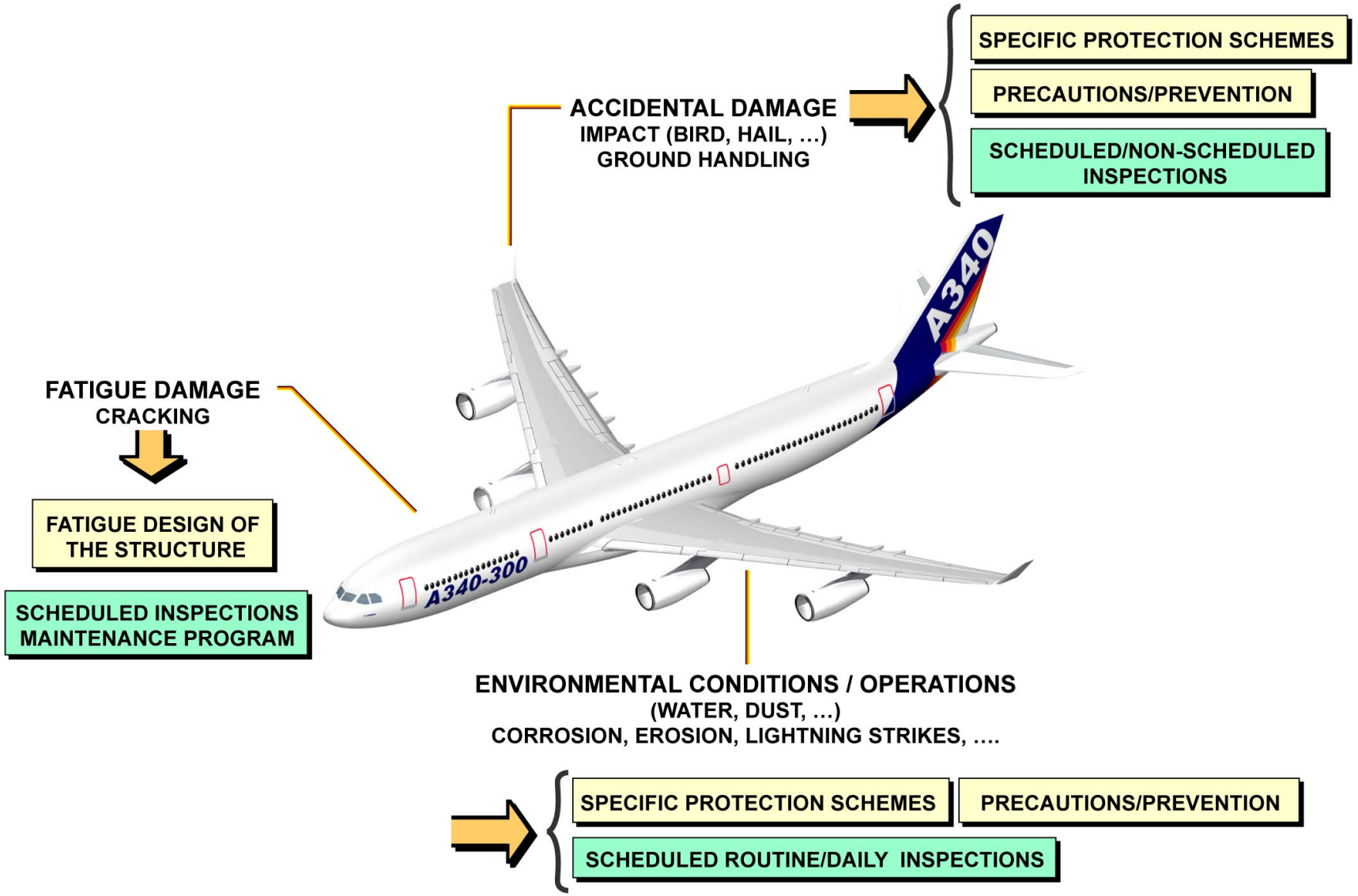
SOURCES OF DAMAGE

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SOURCES OF DAMAGE (continued)

DAMAGE DETECTION/PREVENTION

Concerning fatigue damage, the aircraft is designed and justified, to be free of significant fatigue cracking during its Design Service Goal (DSG). The scheduled structure inspections program is prepared to detect any fatigue cracking before it reaches a critical length.
Inspections for corrosion are also part of the scheduled maintenance program.
Schemes need to draw your attention in order to protect the aircraft structure against known environmental aggressions.
In addition the basic protections should be kept in good conditions and some basic precautions should also be considered.

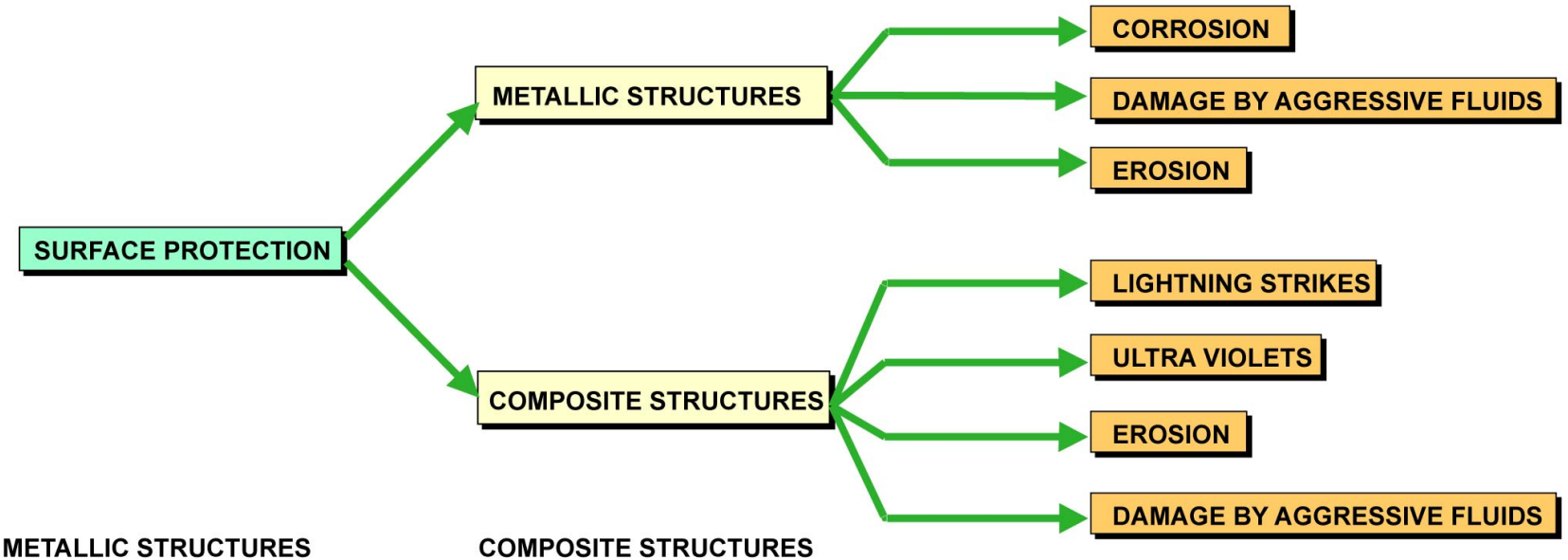


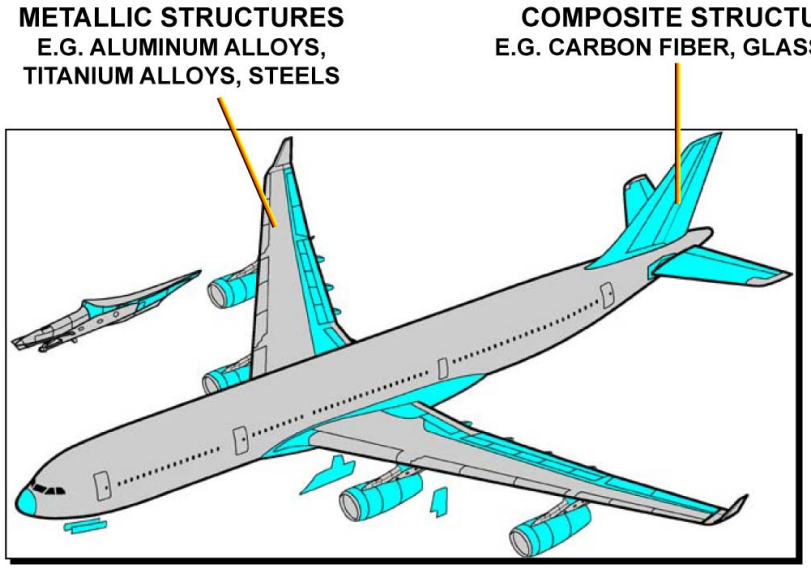
SOURCES OF DAMAGE - DAMAGE DETECTION/PREVENTION

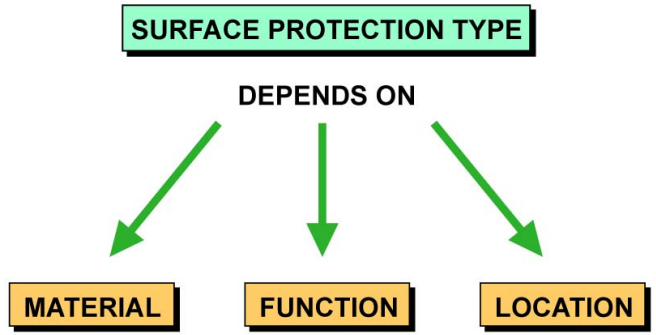
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SURFACE PROTECTIONS

Protective treatments prevent corrosion and damage by aggressive fluids and provide erosion protection to metallic structures.
Composite structures have a surface treatment to protect them against the effects of lightning strike, ultra violet rays, erosion and fluids.
The type of the surface protection of the components depends on:
- the material,
- the function,
- the location.







SURFACE PROTECTIONS

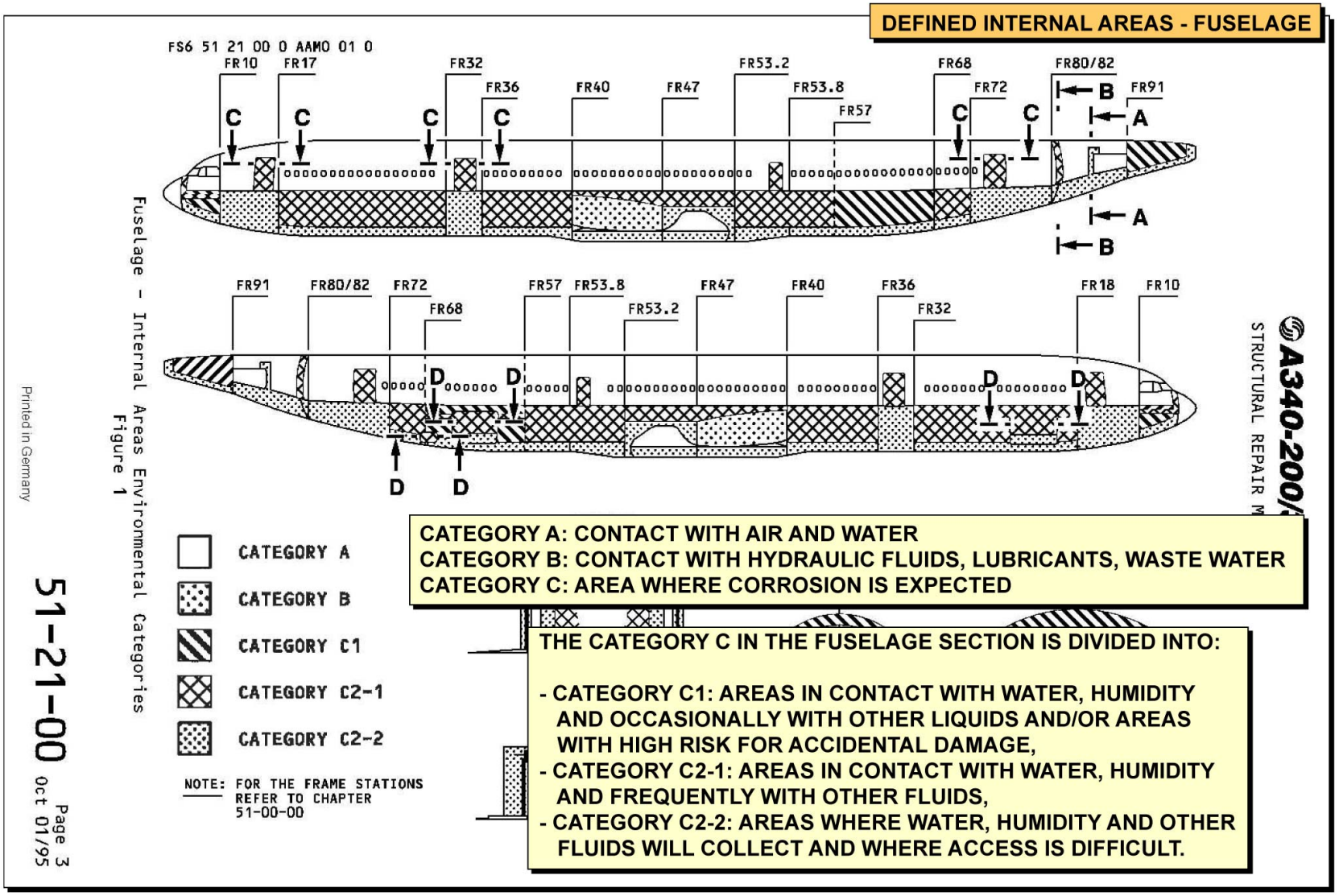
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SURFACE PROTECTIONS (continued)

PROTECTIVE TREATMENTS AREAS - FUSELAGE

All external areas have a surface protection. The following areas are an exception:
- leading edges of slats and engine inlet cowl,
- external surfaces of the pylon made of corrosion resistant materials (stainless steel/titanium),
- scuff plates on passenger and cargo doors,
- APU exhaust,
- equipment components, for example angles of an attached sensor, static port areas.

The internal area of an aircraft is divided into three main zones. Each zone has a different surface protection. These zones are divided as follows:
- Category A: areas in contact with air and water,
- Category B: areas in contact with fuel (including pipes),
- Category C: areas where corrosion can be expected due to:
- contact with hydraulic fluids, lubricants and/or waste water,
- high condensation,
- difficult access, and/or high risk of accidental damage.


DEFINED INTERNAL AREAS - FUSELAGE
FS6 51 21 00 0 AAM0 01 0
FR10 FR17 FR32 FR36 FR40 FR47 FR53.2 FR53.8 FR57 FR68 FR72 FR80/82 FR91
FR91 FR80/82 FR72 FR68 FR57 FR53.8 FR53.2 FR47 FR40 FR36 FR32 FR18 FR10
Fuselage - Internal Areas Environmental Categories
Figure 1
CATEGORY A
CATEGORY B
CATEGORY C1
CATEGORY C2-1
CATEGORY C2-2
NOTE: FOR THE FRAME STATIONS REFER TO CHAPTER 51-00-00
CATEGORY A: CONTACT WITH AIR AND WATER
CATEGORY B: CONTACT WITH HYDRAULIC FLUIDS, LUBRICANTS, WASTE WATER
CATEGORY C: AREA WHERE CORROSION IS EXPECTED
THE CATEGORY C IN THE FUSELAGE SECTION IS DIVIDED INTO:
- CATEGORY C1: AREAS IN CONTACT WITH WATER, HUMIDITY AND OCCASIONALLY WITH OTHER LIQUIDS AND/OR AREAS WITH HIGH RISK FOR ACCIDENTAL DAMAGE,
- CATEGORY C2-1: AREAS IN CONTACT WITH WATER, HUMIDITY AND FREQUENTLY WITH OTHER FLUIDS,
- CATEGORY C2-2: AREAS WHERE WATER, HUMIDITY AND OTHER FLUIDS WILL COLLECT AND WHERE ACCESS IS DIFFICULT.
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STRUCTURAL REPAIR M
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Page 3
Oct 01/95

SURFACE PROTECTIONS - PROTECTIVE TREATMENTS AREAS - FUSELAGE

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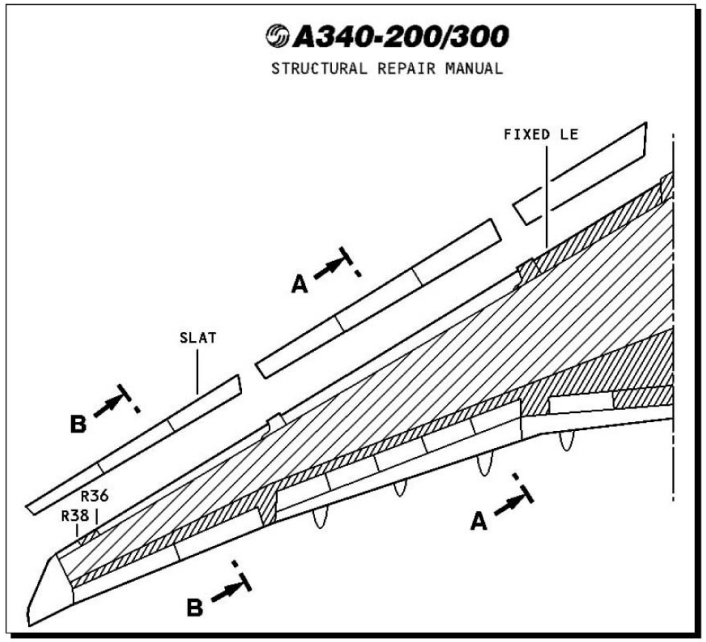
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

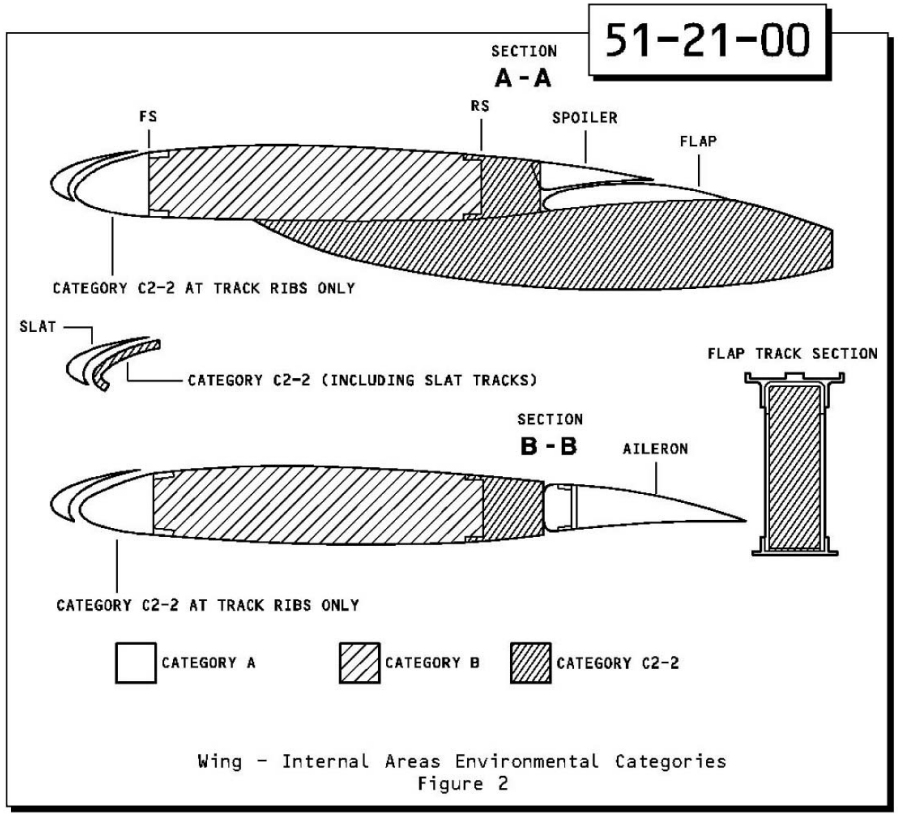
SURFACE PROTECTIONS (continued)

PROTECTIVE TREATMENTS AREAS - WING

This page deals with defined internal areas of surface protections on wing.

DEFINED INTERNAL AREAS - WINGS





Wing - Internal Areas Environmental Categories
Figure 2

CATEGORY A: CONTACT WITH AIR AND WATER
CATEGORY B: CONTACT WITH HYDRAULIC FLUIDS, LUBRICANTS, WASTE WATER
CATEGORY C: AREA WHERE CORROSION IS EXPECTED

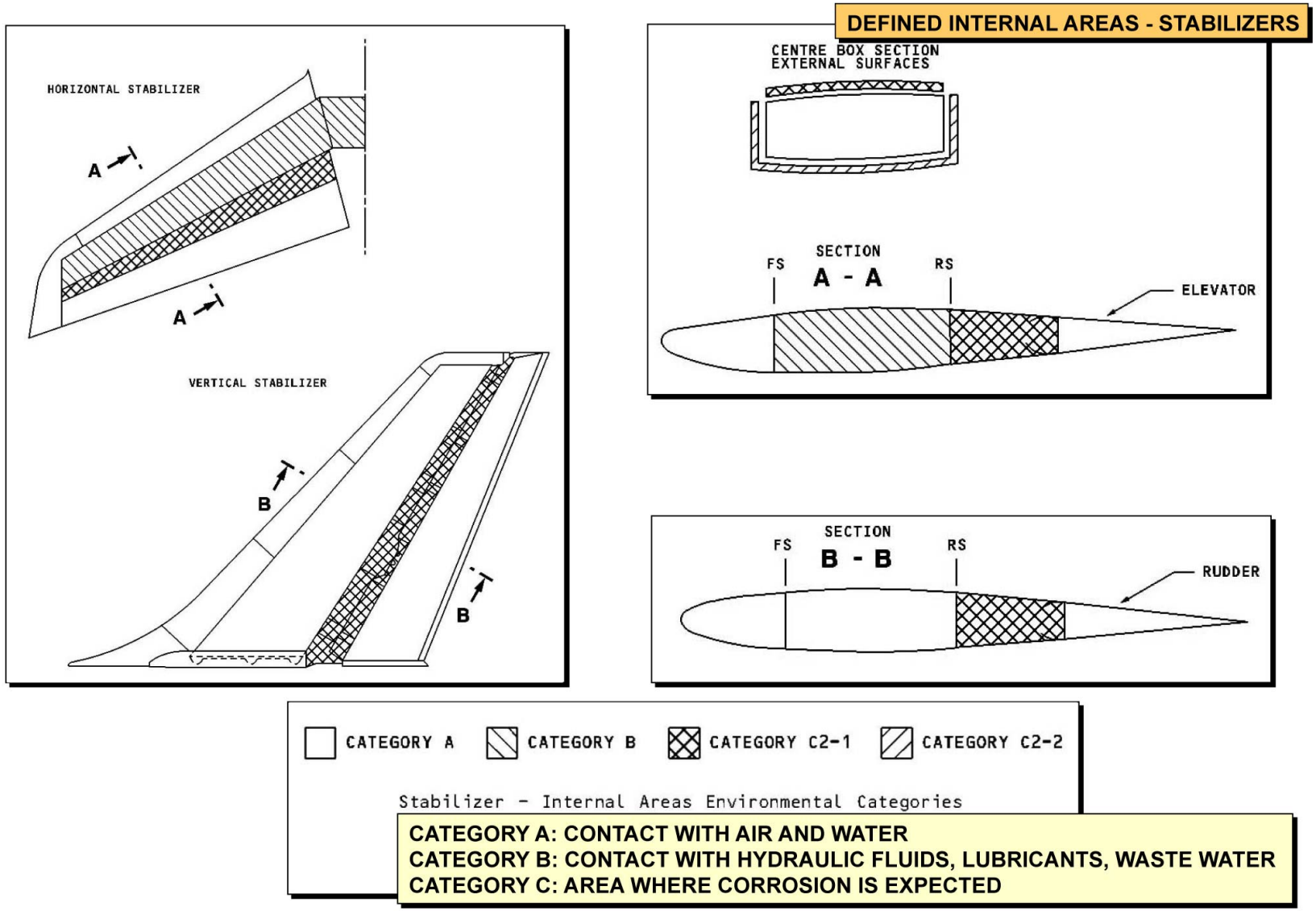
SURFACE PROTECTIONS - PROTECTIVE TREATMENTS AREAS - WING

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SURFACE PROTECTIONS (continued)

PROTECTIVE TREATMENTS AREAS - STABILIZERS

This page deals with defined internal areas of surface protections on stabilizers.



SURFACE PROTECTIONS - PROTECTIVE TREATMENTS AREAS - STABILIZERS

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SURFACE PROTECTIONS (continued)

TYPE OF PROTECTIVE TREATMENTS

The different types of protection are the pretreatments, the paint coatings, the special coatings and the sealants.
The pretreatment is the initial treatment of the metal. It increases the corrosion resistance properties of the metal by chemical or electrolytic procedures and provides a good surface for the adhesion of the subsequent paint coatings.
Paint coatings can be divided as follows and have the subsequent functions:
- the primer, which increases the corrosion resistance properties, because it contains corrosion inhibitors. The primer also protects the surface against corrosive agents and gives a good surface for the adhesion of the subsequent paint coatings.
- the top coat (or paint with finish); its function is to protect the layers of the primer and to give the aircraft the necessary appearance.
- special coatings: special coatings are applied to those areas which require a special corrosion protection.
Two types of special coatings are used:
- type 1 - water repellent coating: generally made from silicone free materials organically bound with a mineral oil base to repel moisture,
- type 2 - heavy duty corrosion preventive compound: grease-like coatings containing corrosion inhibitors which protect against corrosive agents.

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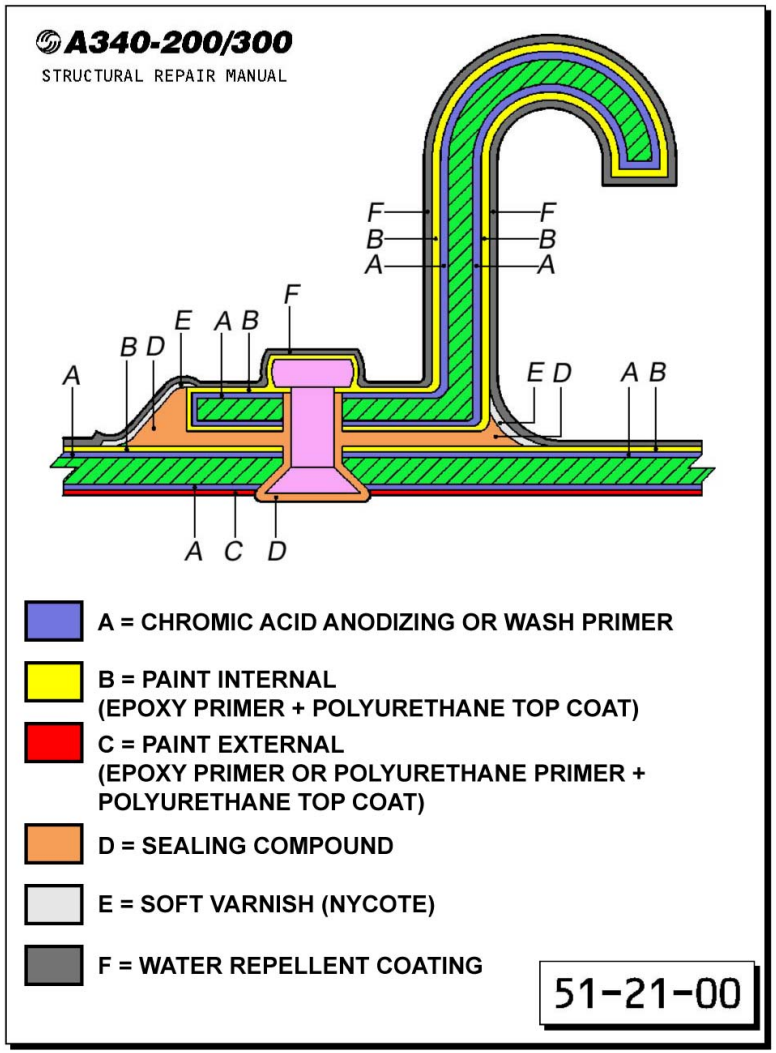


TYPICAL PROTECTION SCHEME FOR
SKIN / STRINGER ATTACHMENT AREA (LOWER SHELLS)

PROTECTION TYPES

PRE-TREATMENTS

(EXAMPLE: CHROMIC ACID ANODIZING (CAA) FOR ALUMINUM ALLOYS)

PAINT COATINGS
- PRIMER
- POLYURETHANE TOP COAT

SPECIAL COATINGS
- CORROSION-PREVENTIVE COMPOUND
- WATER-REPELLENT PROTECTIVE COATING

SEALANTS

SURFACE PROTECTIONS - TYPE OF PROTECTIVE TREATMENTS

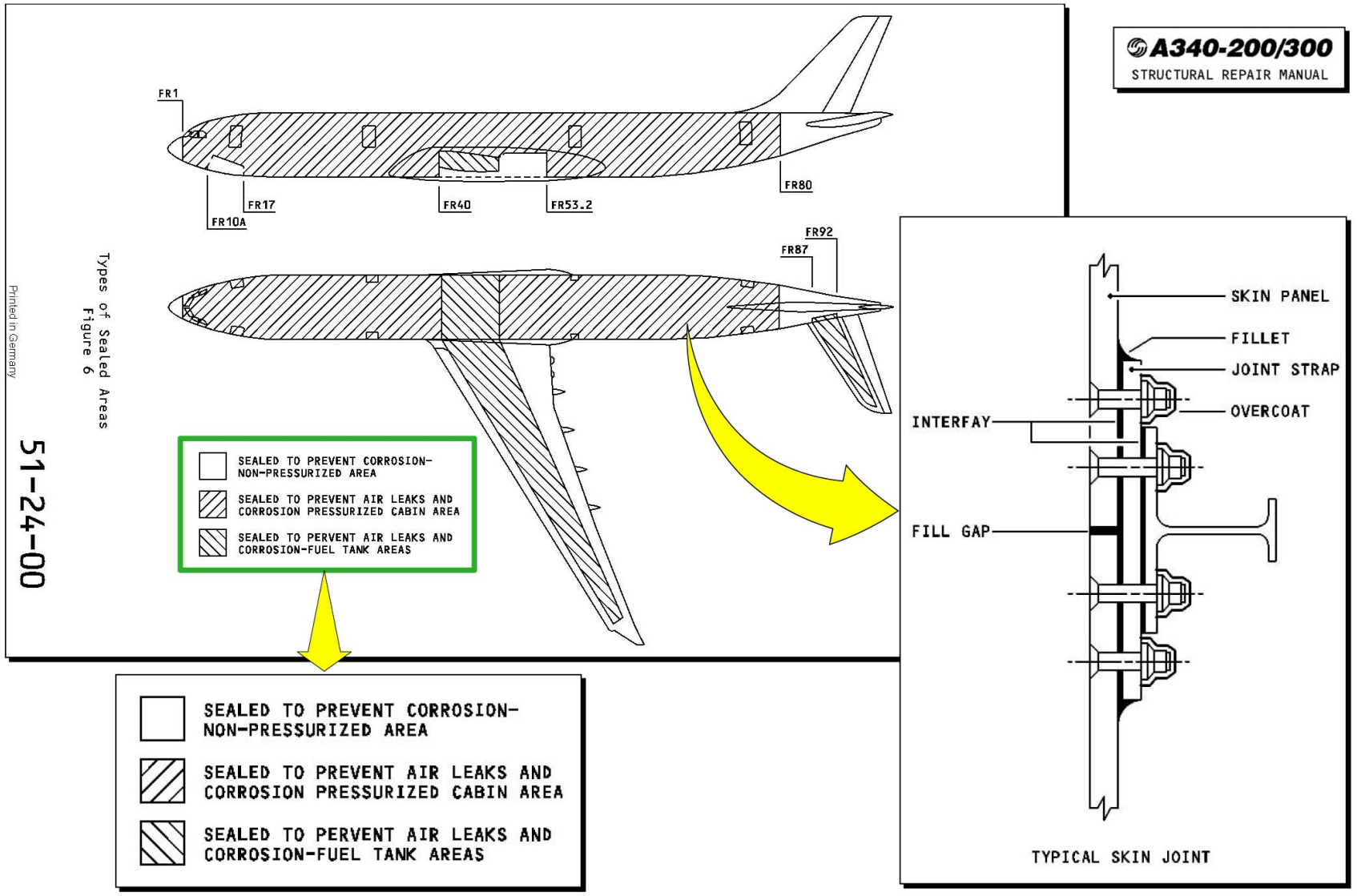
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SEALANTS

SEALING IN TYPICAL FUSELAGE AREAS

Sealants have many functions on the aircraft. Some used for corrosion prevention, have subsequent functions:
- sealing the external joints of the aircraft structure to make sure that water does not go into the structure,
- sealing the riveted, bolted or bonded joints to make sure that liquids do not get into the joints,
- to prevent corrosion (galvanic action) between different metals,
- to prevent fatigue, stress or vibration between parts of the structure which can cause fretting corrosion,
- to level the drain paths to the drain holes.

In specified areas of the aircraft, for example on the lower shell, a protective layer is added on the top of the sealant. This layer is added to make sure that other materials (for example, fuel, hydraulic oil, engine oil and waste fluids from the toilets and galleys) do not cause a deterioration of the sealant.



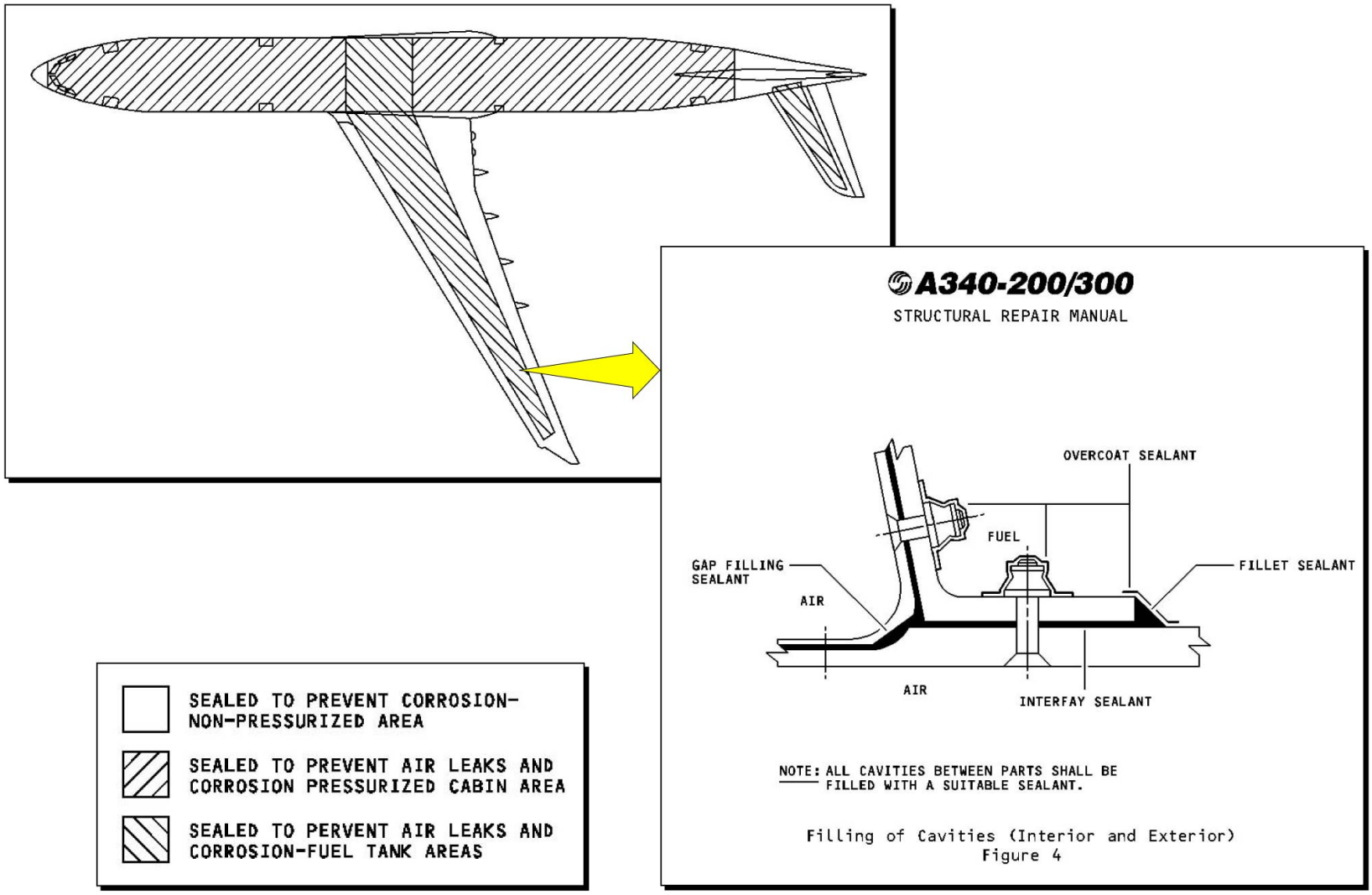
SEALANTS - SEALING IN TYPICAL FUSELAGE AREAS

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

SEALANTS (continued)

SEALING IN TYPICAL FUEL TANK AREAS

In the fuel tanks, the sealant is used to prevent fuel leaks and corrosion of the fuel tank.


A340-200/300
STRUCTURAL REPAIR MANUAL
OVERCOAT SEALANT
FUEL
GAP FILLING SEALANT
FILLET SEALANT
AIR
AIR
INTERFAY SEALANT
NOTE: ALL CAVITIES BETWEEN PARTS SHALL BE FILLED WITH A SUITABLE SEALANT.
Filling of Cavities (Interior and Exterior)
Figure 4
SEALED TO PREVENT CORROSION-NON-PRESSURIZED AREA
SEALED TO PREVENT AIR LEAKS AND CORROSION PRESSURIZED CABIN AREA
SEALED TO PERVENT AIR LEAKS AND CORROSION-FUEL TANK AREAS

SEALANTS - SEALING IN TYPICAL FUEL TANK AREAS

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

DRAINAGE

During normal flights, liquids stagnate in the lower part of the fuselage shell. These liquids can be present as a result of condensation or leakage from the aircraft systems. It is very important that these liquids do not remain in the fuselage shell, because they can cause corrosion.
Make sure that the liquids stagnation in the fuselage is drained from the fuselage, by applying the following procedures:
- drain holes are made in those parts of the fuselage which are not pressurized in flight,
- special drain valves are installed in those parts of the fuselage which are pressurized in flight.

The drain holes and the drain valves are usually at the lowest part of the fuselage.
It is important that any unwanted liquids pass through the drain holes or valves. The structure of the lower fuselage is constructed so that a path is given for these liquids. When you do a repair make sure that you keep and clear this path from unwanted materials.

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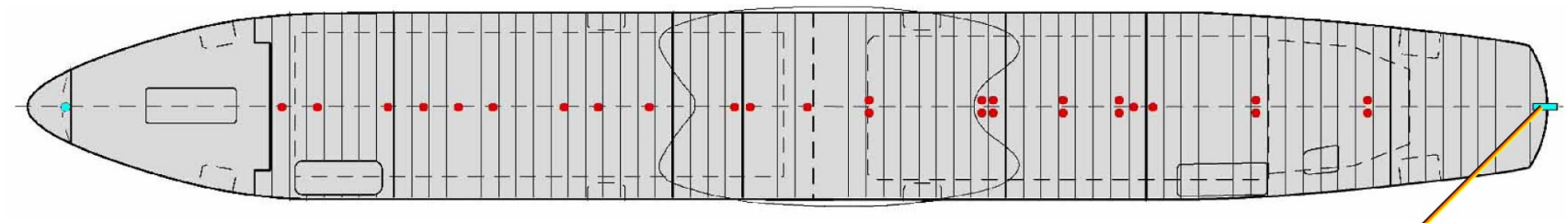
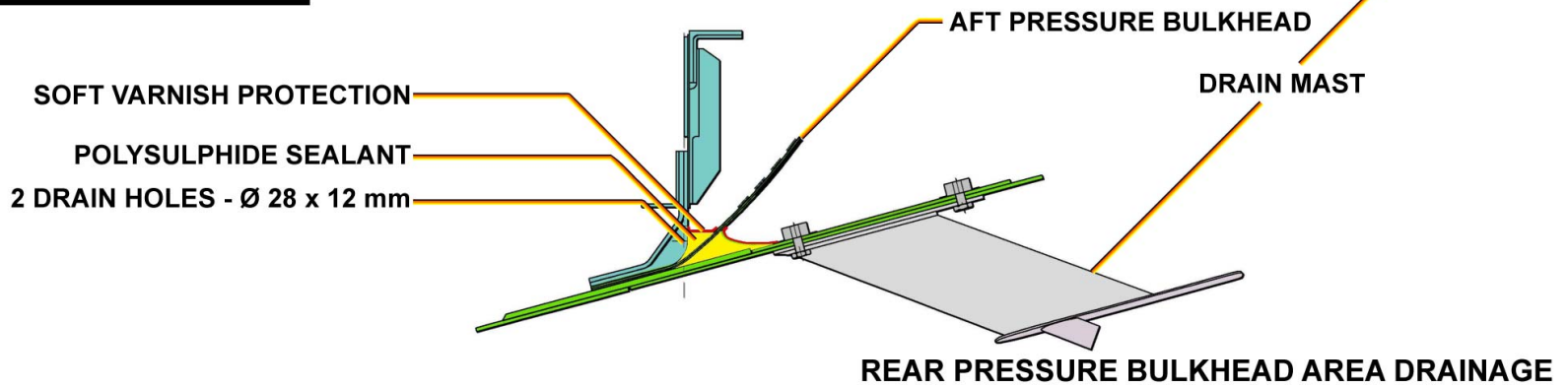
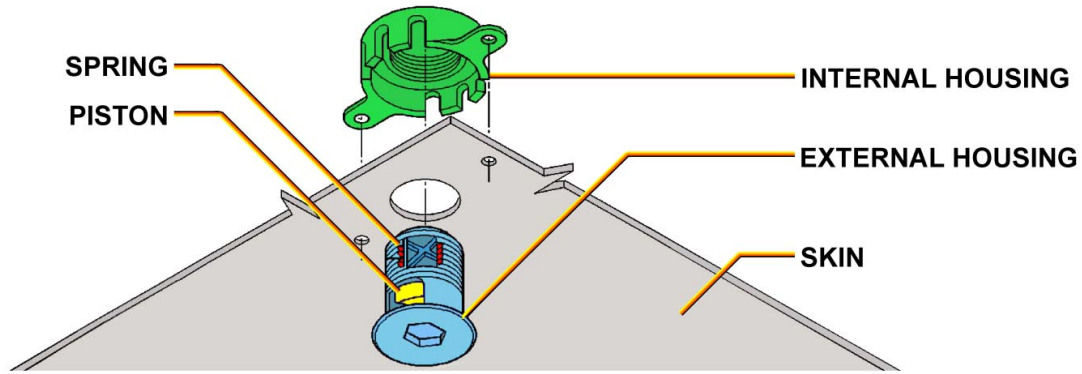


● PRESSURE DRAIN VALVES



REAR PRESSURE BULKHEAD AREA DRAINAGE

TYPICAL PRESSURE DRAIN VALVE



DRAINAGE

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

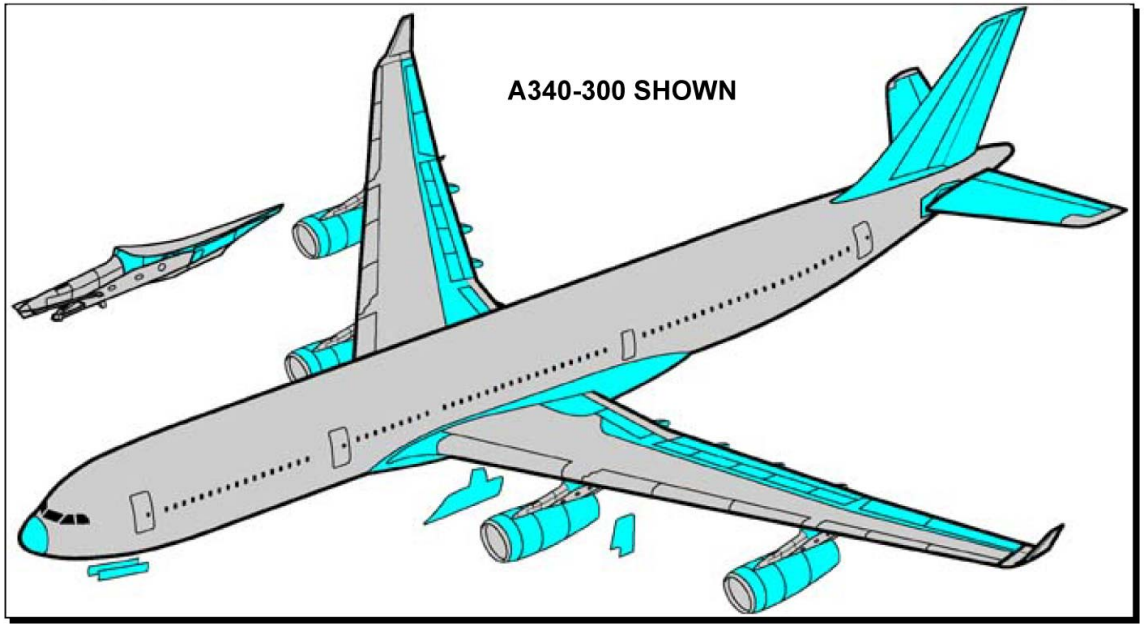
COMPOSITE PARTS PROTECTION

COMPOSITE DAMAGES

Composite structures can be damaged by lightning strikes or handling operations. The environmental conditions (like rain, dust) can also be a source of damage.
The structure can also be affected by impact of foreign objects or birds for example.
At the design stage, the structure has the maximum protection against these different sources of damage.

COMPOSITE STRUCTURES LOCATIONS
(NOT SHOWN: REAR PRESSURE BULKHEAD AND CABIN FLOOR PANELS)

- LIGHTNING STRIKE DAMAGE
- HANDLING
- ENVIRONMENTAL DAMAGE
- IMPACT DAMAGE



STRUCTURE PROTECTIONS & AWARENESS D/O (3)

COMPOSITE PARTS PROTECTION (continued)

LIGHTNING STRIKE PROTECTION

Lightning has always two or more attachment points (one entry and one exit) on the aircraft skin.
Lightning moves back along the surface of the aircraft (swept stroke zone) between the entry and the exit point. This can cause a chain of scattered attachment points along a line in the direction of travel of the aircraft.
Lightning hits some areas more frequently than others.
The aircraft is divided into three zones related to the probability of lightning strike, and which determines the type and level of protection applied:
- Zone 1: surfaces where there is a high probability of initial lightning attachment (entry or exit),
- Zone 2: surfaces where there is a high probability of a swept stroke zone. The lightning strike has its initial point of attachment in Zone 1 and moves into Zone 2.
- Zone 3: this zone includes all of the aircraft surfaces that are not in Zone 1 and 2. In Zone 3 there is a low probability of attachment of a lightning strike. However, high lightning currents can go through Zone 3 by direct conduction between 2 attachment points. Zone 3 currents will also go into Zones 1 and 2.

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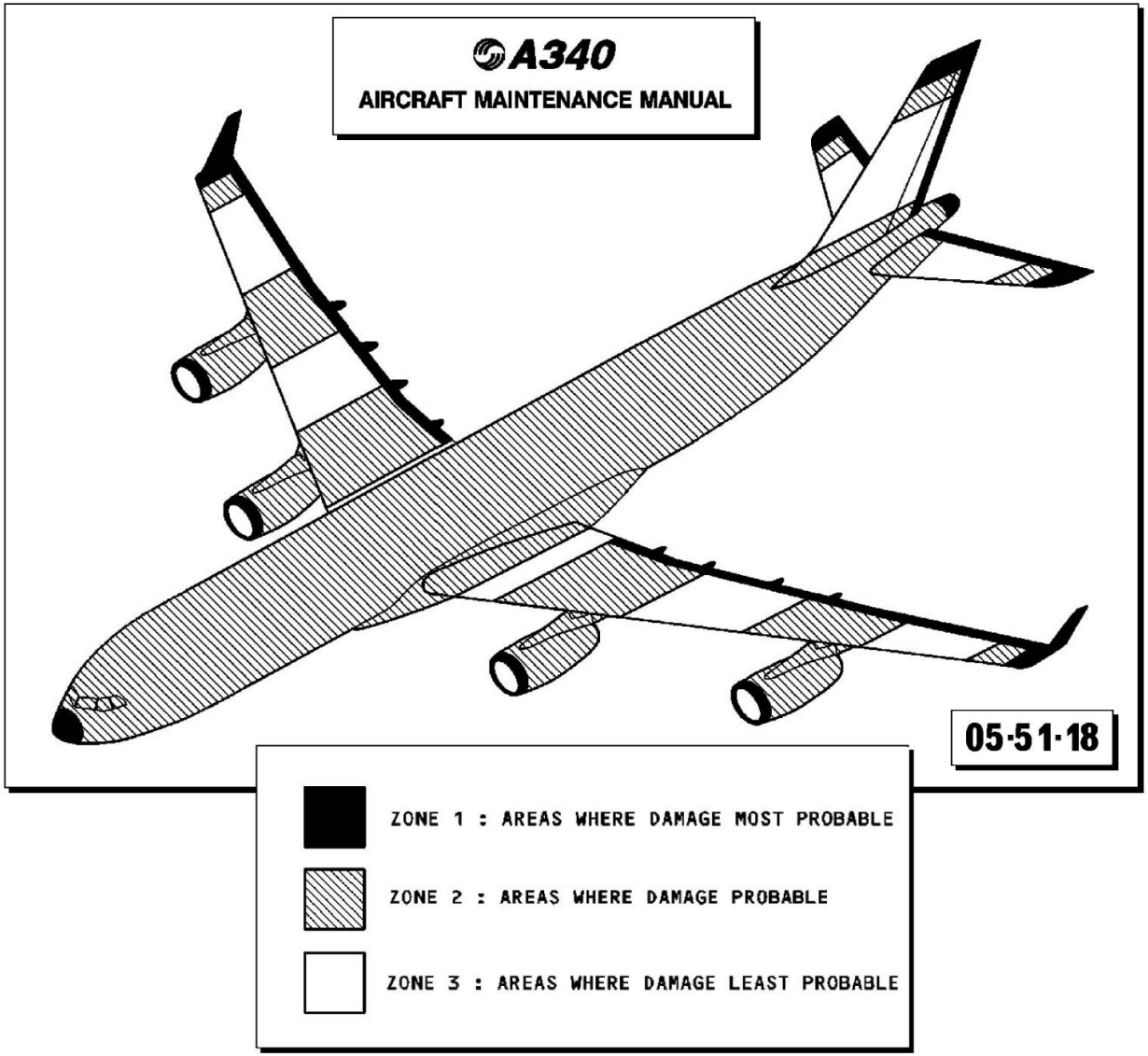

A340
AIRCRAFT MAINTENANCE MANUAL
05-51-18
ZONE 1 : AREAS WHERE DAMAGE MOST PROBABLE
ZONE 2 : AREAS WHERE DAMAGE PROBABLE
ZONE 3 : AREAS WHERE DAMAGE LEAST PROBABLE

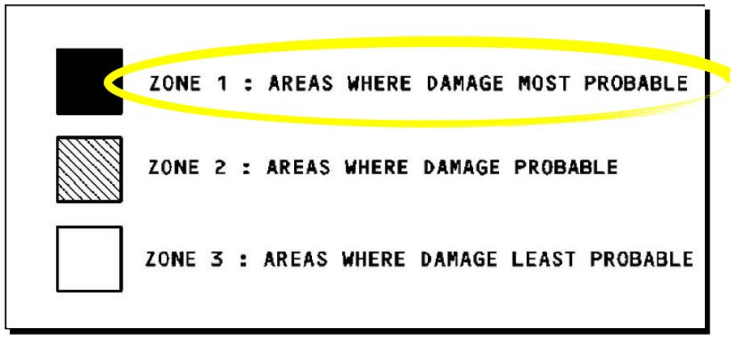
COMPOSITE PARTS PROTECTION - LIGHTNING STRIKE PROTECTION

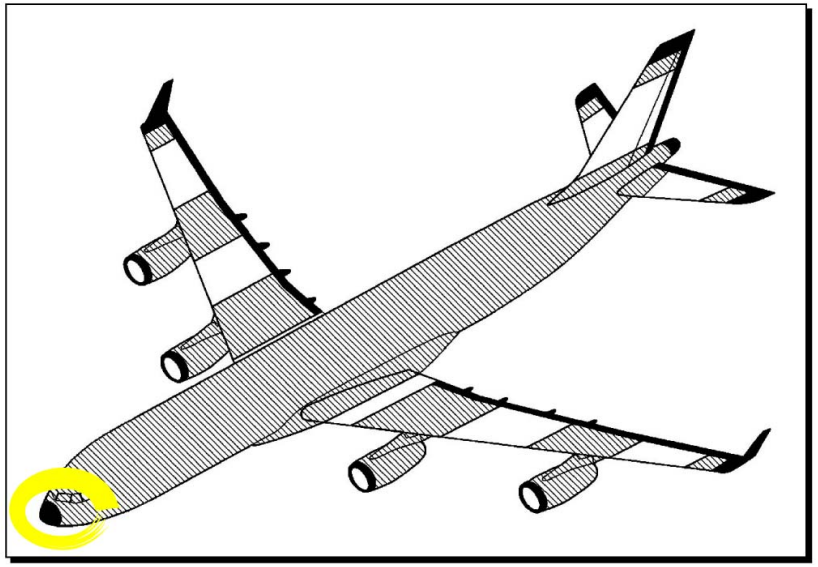
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

COMPOSITE PARTS PROTECTION (continued)

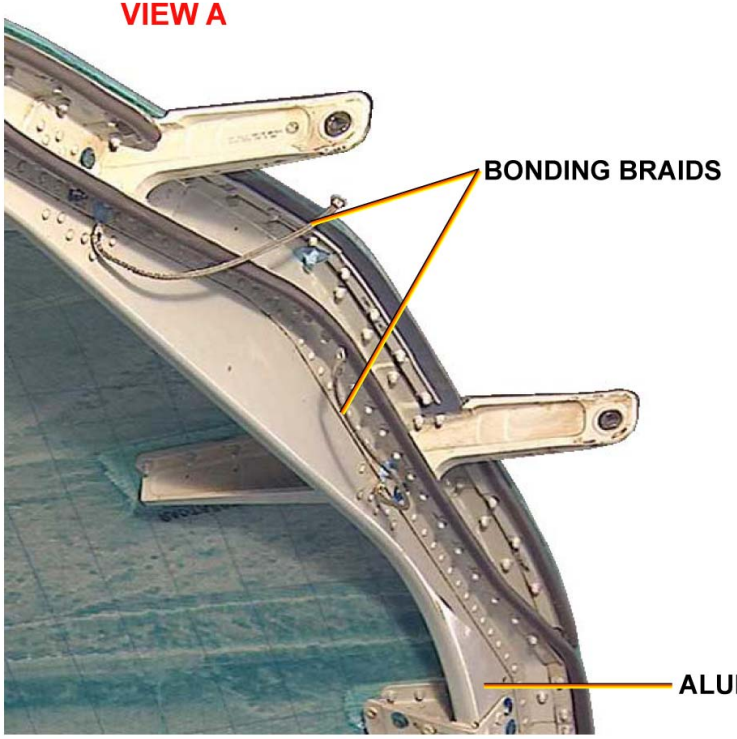
LIGHTNING STRIKE PROTECTION - RADOME

Here is an example of lightning strike protection in Zone 1: the radome, which is a sandwich structure with quartz fiber skins, is protected by copper straps on the external surface, and an aluminum alloy frame connected to the fuselage structure via bonding braids.

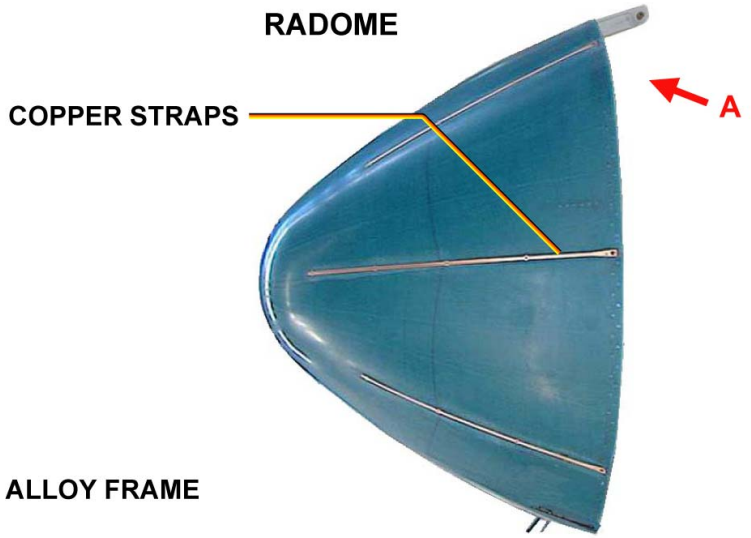




VIEW A



RADOME



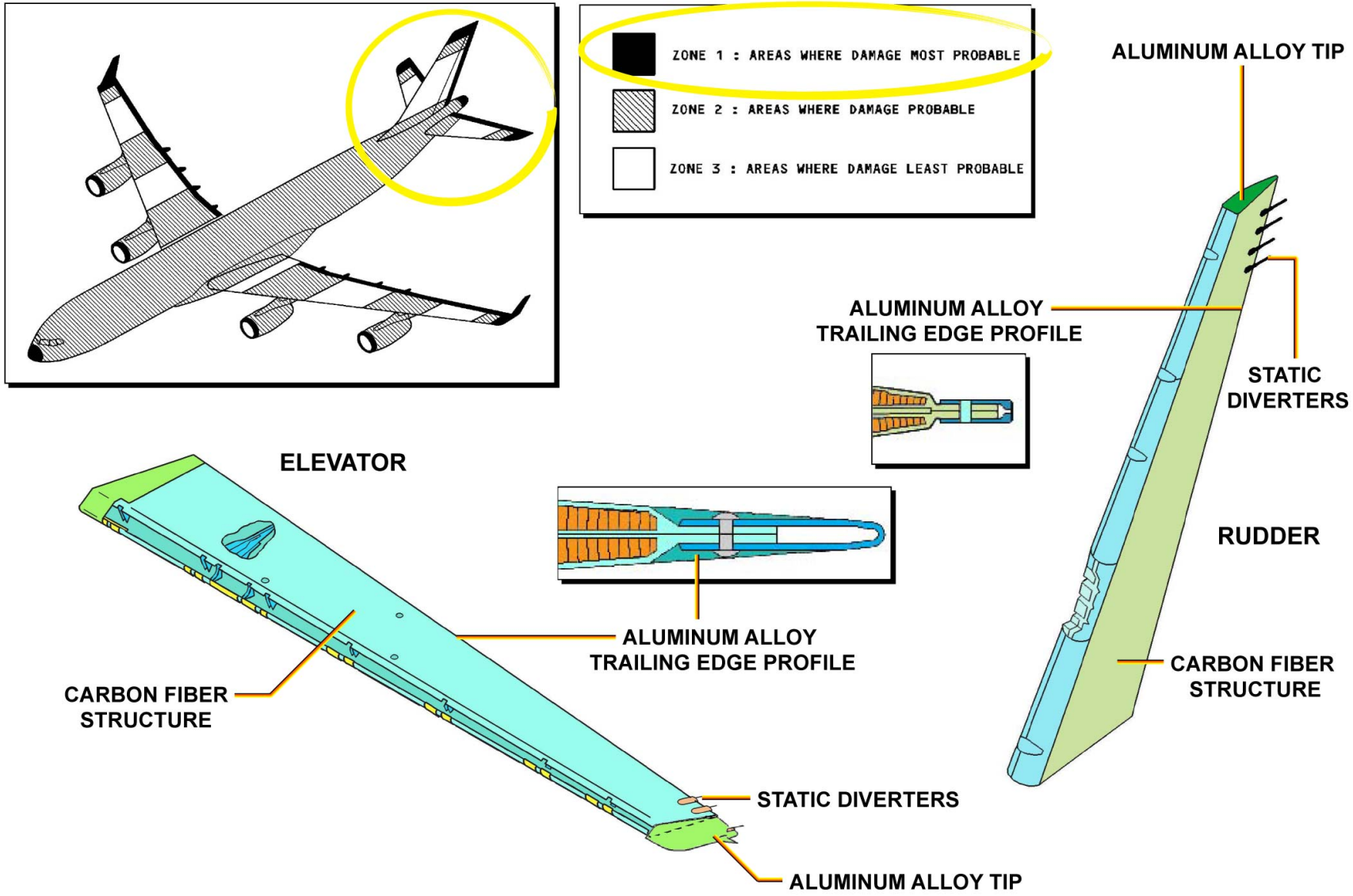
COMPOSITE PARTS PROTECTION - LIGHTNING STRIKE PROTECTION - RADOME

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

COMPOSITE PARTS PROTECTION (continued)

LIGHTNING STRIKE PROTECTION - ELEVATORS AND RUDDER

This second example illustrates the lightning strike protection of elevators, rudder trailing edges and tip, which are also located in Zone 1. The elevators and the rudder are basically carbon fiber structures. Their trailing edges are made of an aluminum alloy profile and their tips are also in aluminum alloy.



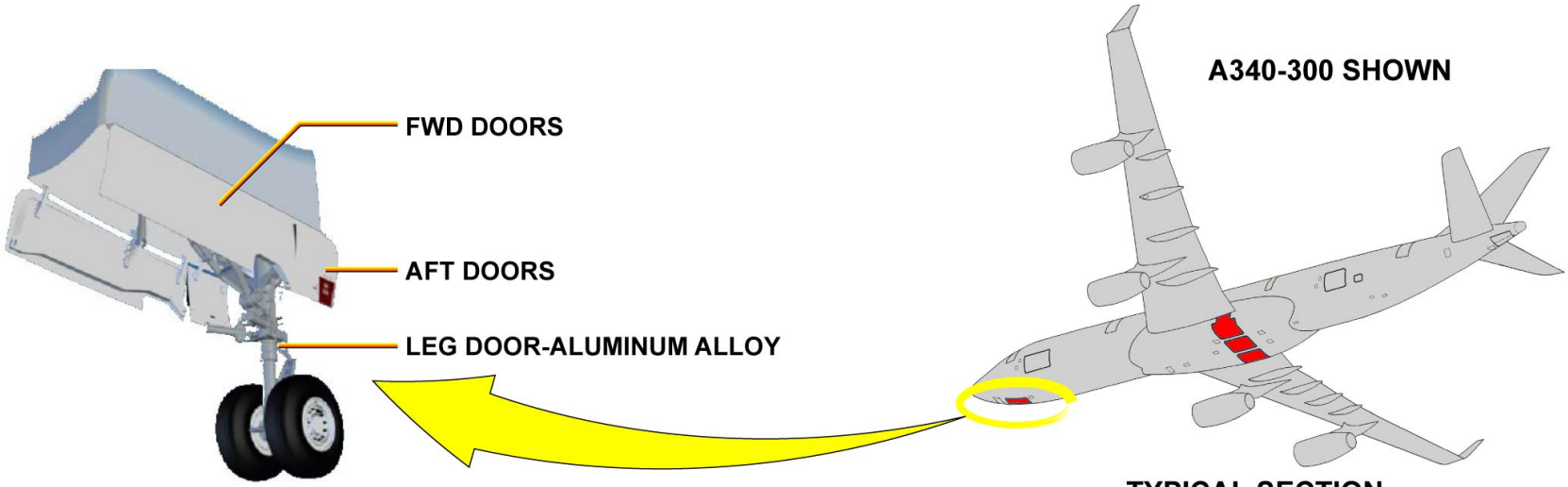
COMPOSITE PARTS PROTECTION - LIGHTNING STRIKE PROTECTION - ELEVATORS AND RUDDER

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

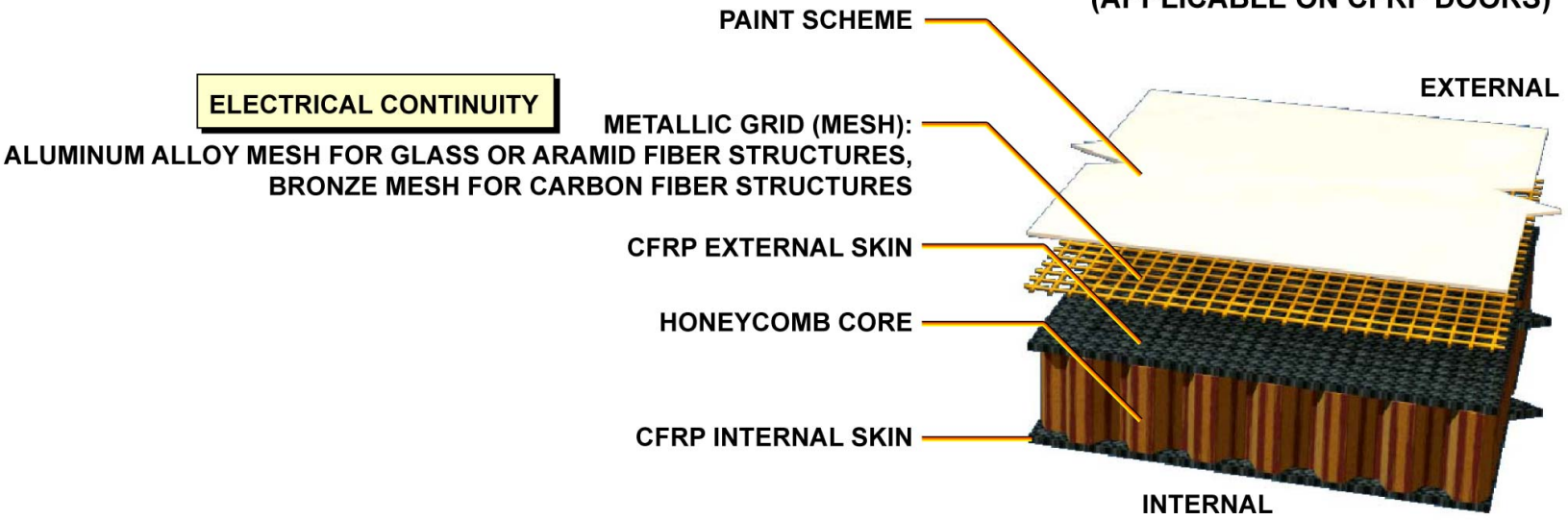
COMPOSITE PARTS PROTECTION (continued)

LIGHTNING STRIKE PROTECTION - ELECTRICAL CONTINUITY

The Nose Landing Gear (NLG) doors are located in Zone 2, their protection and the electrical continuity is achieved using a metallic grid installed at the manufacturing stage on the top of the composite layers. Note that in most cases, this grid should be repaired when damaged, as per SRM procedures. Note that in most cases, this grid should be repaired when damaged, following Structure Repair Manual (SRM) procedures.



TYPICAL SECTION
(APPLICABLE ON CFRP DOORS)



ELECTRICAL CONTINUITY

CFRP: Carbon Fiber Reinforced Plastic

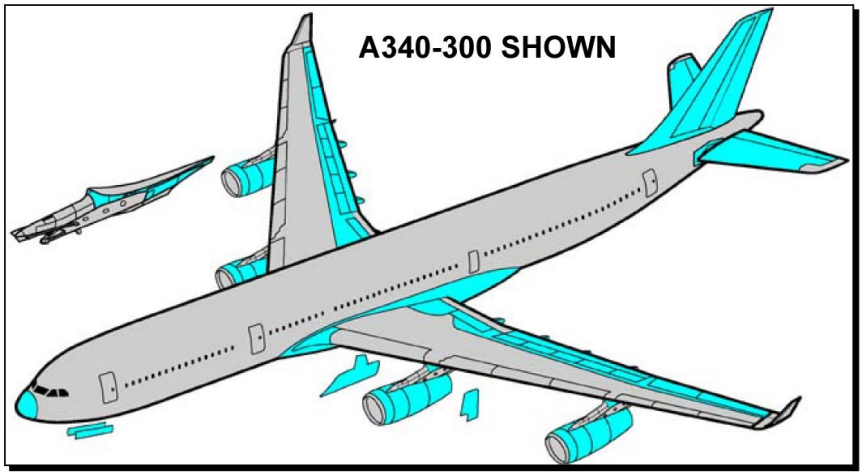
COMPOSITE PARTS PROTECTION - LIGHTNING STRIKE PROTECTION - ELECTRICAL CONTINUITY

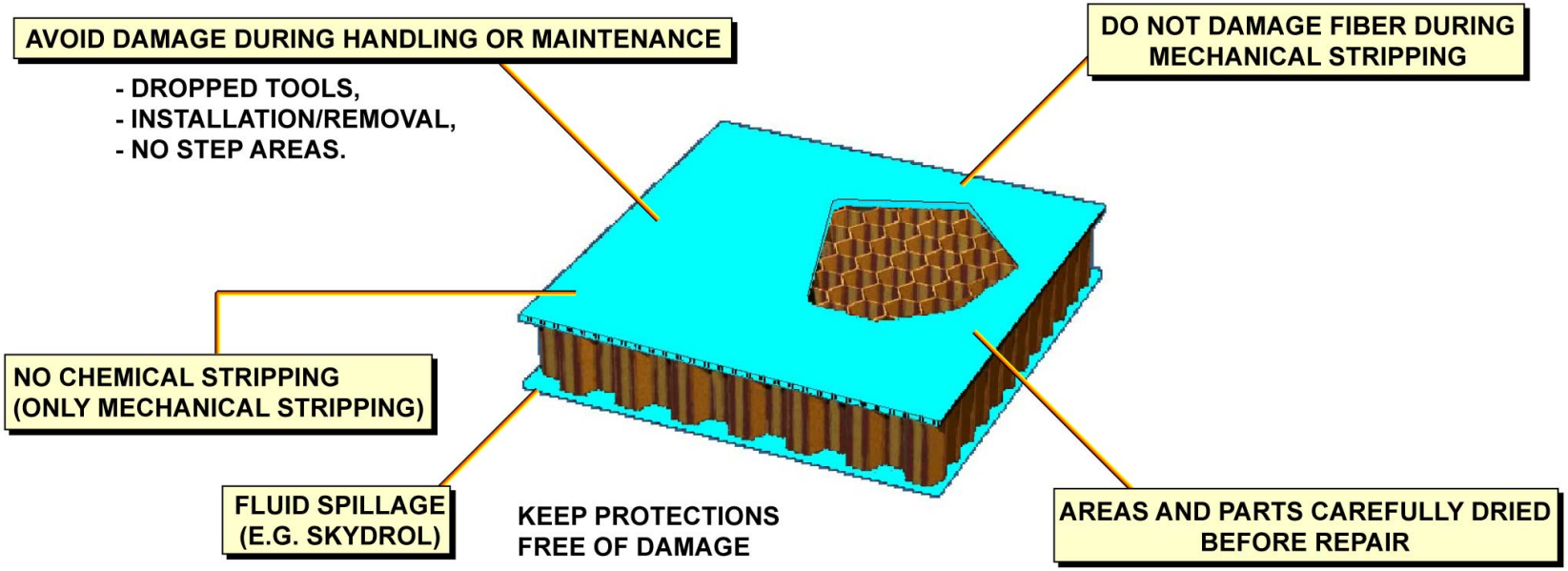
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

COMPOSITE PARTS PROTECTION (continued)

LIGHTNING STRIKE PROTECTION - HANDLING OF COMPOSITE STRUCTURES

To keep composite structures in good and serviceable conditions, the operator should avoid any damage during handling and/or maintenance operations (such as chopped tools, take care of no step areas,...).
Chemical strippers are not authorized on composite structures (the resin system may be deteriorated).
The protection like paint schemes and special layers (e.g. tedlar layers on internal surfaces) should be kept in good condition.
The drying of composites is also essential before hot bonding repair operations.




AVOID DAMAGE DURING HANDLING OR MAINTENANCE
- DROPPED TOOLS,
- INSTALLATION/REMOVAL,
- NO STEP AREAS.
DO NOT DAMAGE FIBER DURING MECHANICAL STRIPPING
NO CHEMICAL STRIPPING (ONLY MECHANICAL STRIPPING)
FLUID SPILLAGE (E.G. SKYDROL)
KEEP PROTECTIONS FREE OF DAMAGE
AREAS AND PARTS CAREFULLY DRIED BEFORE REPAIR

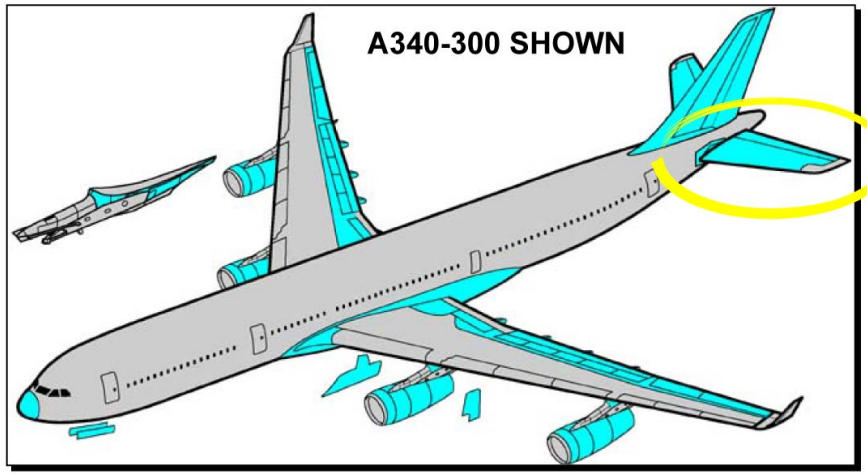
COMPOSITE PARTS PROTECTION - LIGHTNING STRIKE PROTECTION - HANDLING OF COMPOSITE STRUCTURES

STRUCTURE PROTECTIONS & AWARENESS D/O (3)

COMPOSITE PARTS PROTECTION (continued)

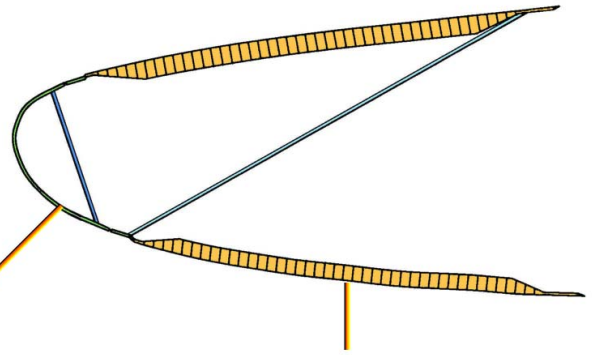
ENVIRONMENTAL AND IMPACT PROTECTION OF COMPOSITE STRUCTURES

The impact protection of the Trimmable Horizontal Stabilizer (THS) leading edge is achieved via a metallic nose plate.



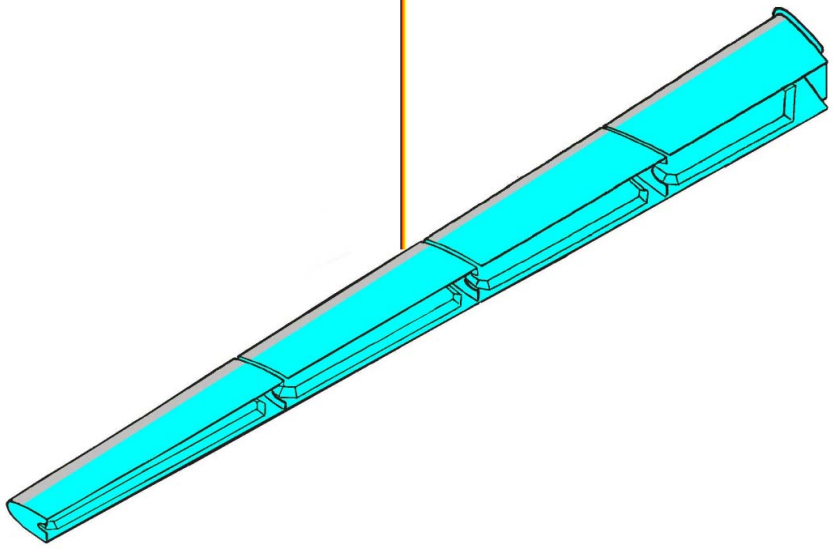
IMPACT PROTECTION OF THS LEADING EDGE

TYPICAL CROSS - SECTION



METALLIC PROTECTIVE NOSE PLATE

CFRP (SANDWICH)



CFRP: Carbon Fiber Reinforced Plastic

COMPOSITE PARTS PROTECTION - ENVIRONMENTAL AND IMPACT PROTECTION OF COMPOSITE STRUCTURES

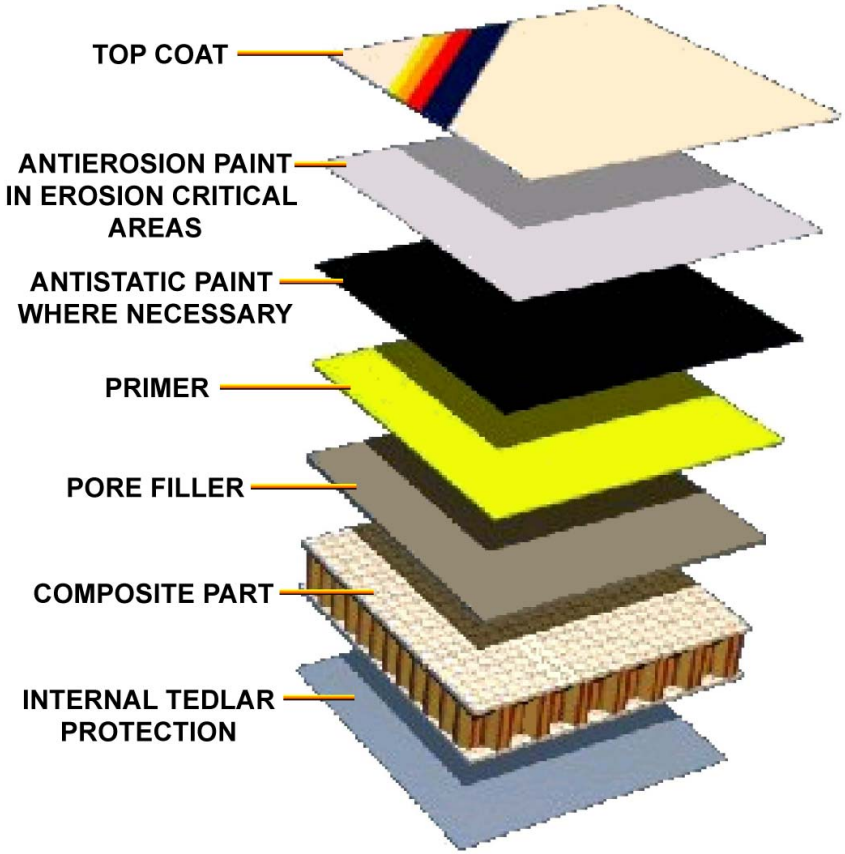
STRUCTURE PROTECTIONS & AWARENESS D/O (3)

COMPOSITE PARTS PROTECTION (continued)

ENVIRONMENTAL AND IMPACT PROTECTION OF COMPOSITE STRUCTURES (CONT'D)

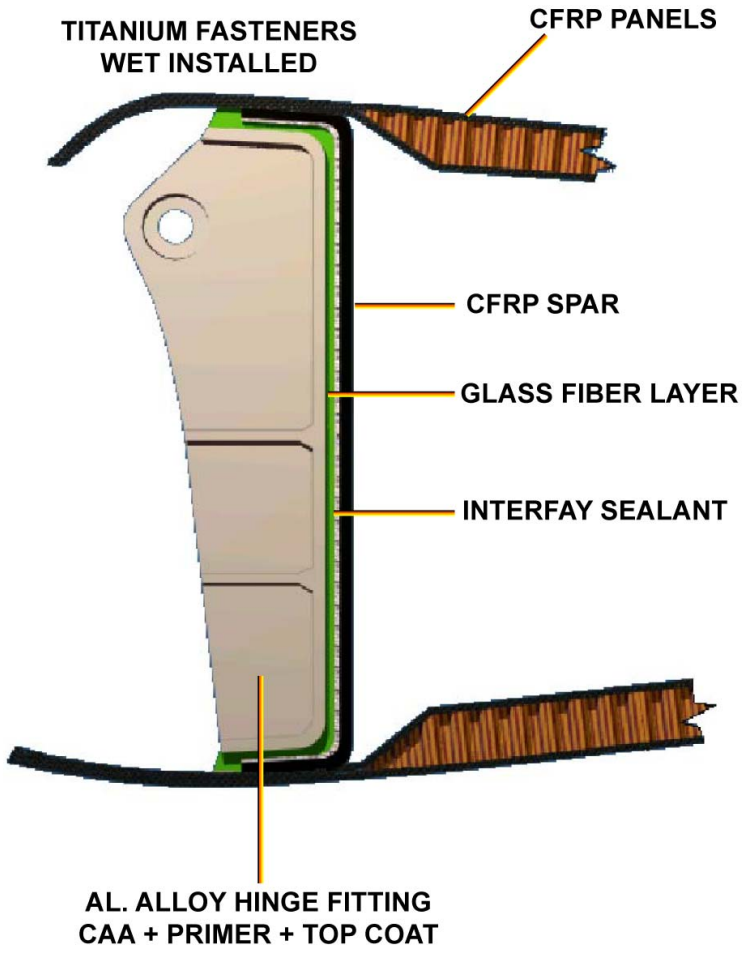
The protection against environmental aggressions (rain, ultra-violets, ...) is achieved by the application of a correct paint scheme associated with internal protective layers (e.g. tedlar).
This paint should be kept in good conditions and repaired when damaged following SRM procedures.
The galvanic corrosion protection of aluminum alloy parts in contact with carbon fiber parts is achieved as follows:
- additional glass fiber layer(s) on top of carbon in contact areas,
- full protection of aluminum alloy parts (pretreatment, primer, top coat),
- interfay sealant,
- titanium fasteners.

PROTECTION AGAINST ENVIRONMENTAL AGGRESSIONS PAINT SCHEME



CFRP: Carbon Fiber Reinforced Plastic
CAA: Chromic Acid Anodizing

GALVANIC CORROSION PROTECTION (CONTACT AREAS ALUMINUM/CARBON FIBER)



COMPOSITE PARTS PROTECTION - ENVIRONMENTAL AND IMPACT PROTECTION OF COMPOSITE STRUCTURES (CONT'D)

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

GENERAL

The types of damage on metallic and composite structures are described in SRM 51-11-00 chapter dealing with damage classification.
A table provides for each type of damage, its term, its cause and its description.
A damage results from many causes and can be generally categorized into four main groups:
- mechanical action,
- chemical or electrochemical reaction,
- thermal action or cycling,
- and inherent metallurgical characteristics.

DAMAGE CLASSIFICATION

A330 SRM | A340-500/-600 SRM | A340-200/300 SRM

1. General

A. The term 'damage' includes any and every type of permanent deformation or alteration to any cross-section of a structural component.

B. Deformation or alteration to the cross-section of a structural component results from many causes, which can be generally categorized into four main groups (Refer to Table 1):

- Mechanical action (Group A)
- Chemical or electro-chemical reaction (Group B)
- Thermal action or cycling (Group C)
- Inherent metallurgical characteristics (Group D)

2. Examination of Damage

CAUTION: HIDDEN DAMAGE CAN LEAD TO A FAILURE OF THE REPAIR OR SURROUNDING STRUCTURE

A. Examine the type and extent of the damage.

B. To determine the damage category:

- remove all unwanted material from the surface of the damaged component,
- cut out all broken, bent, heated or damaged areas of the component,
- remove all loose rivets.

(1) In all forms of damage, particularly where shock has been sustained, secondary damage is likely to exist. Therefore, a close examination of the structure surrounding the initial damage must be made. Damage caused by transmission of force may be located some distance from the impact, resulting in structure deformation, drawn rivets or bolt holes.

(2) If misalignment or twisting of the airplane structure is suspected, alignment and/or leveling checks must be carried out.

3. Damage Categories

A. After cleaning and investigating the damage and surrounding area, the damage must be classified into one of the following categories, also taking into account the location of the damage.

(1) Repairable Damage

The damage must be classified either as 'Allowable Damage' or as damage which requires a repair.

(a) Refer to Allowable Damage (Chapter 51-11-11).

(b) Non allowable Damage

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TERM GROUP DEFINITION

A340-500/600
A340-500/600
STRUCTURAL REPAIR MANUAL

TERM	GROUP				DEFINITION
	A	B	C	D	
Abrasion	X		X		An abrasion is a damage area of all sizes which causes change in a cross-sectional area because of scuffing, rubbing, scraping or other surface erosion. It is usually rough and irregular.
Debonding	X	X	X		Debonding is when a separation of materials occurs due to an adhesive failure.
Delamination	X	X	X		Delamination is when the separation of plies occurs in a multi-laminate material. This can be caused by the material being hit - Impact Delamination, or when there is a resin failure for any other reason.
Fretting	X				Surface damage at the interface between elements of the joints resulting from very small angular or linear movements. Evidence of fretting is usually the production of fine black powder staining.

Definition of Damage

Table 1

CAUSES OF DAMAGE PER GROUP :
- A ⇨ MECHANICAL ACTION
- B ⇨ CHEMICAL OR ELECTROCHEMICAL REACTION
- C ⇨ THERMAL ACTION OR CYCLING
- D ⇨ INHERENT METALLURGICAL CHARACTERISTICS

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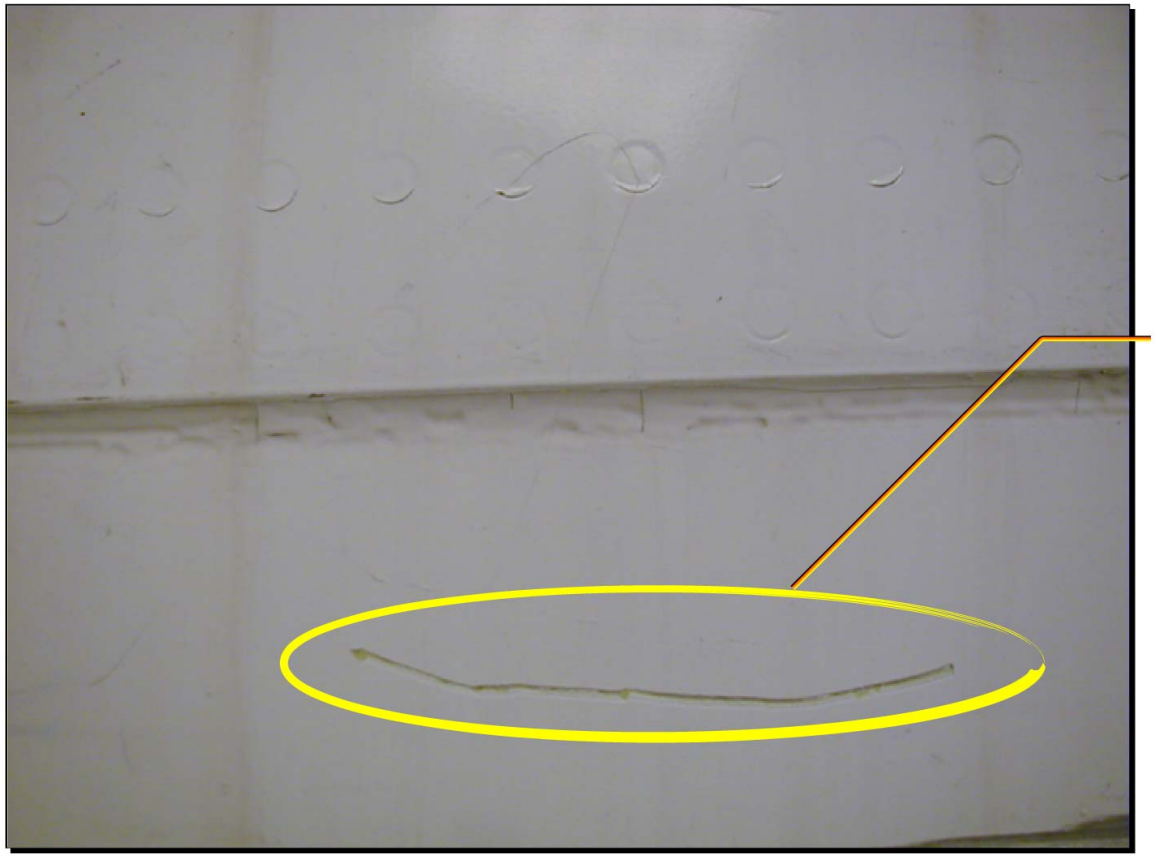
GENERAL

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE

SCRATCH

A scratch is a linear damage of any depth and length in the material, which causes a change of the cross-sectional area of the surface.



A SCRATCH IS A LINEAR DAMAGE WHICH CAUSES A CHANGE OF THE CROSS-SECTIONAL AREA OF THE SURFACE.

TYPES OF DAMAGE ON STRUCTURE - SCRATCH

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

CORROSION

Corrosion is the destruction of metal by chemical or electrochemical effect. Refer to SRM 51-22-00 for general information concerning corrosion.

The different types of corrosion that can occur on the aircraft are:

- pitting corrosion,
- filiform corrosion,
- intergranular corrosion,
- galvanic corrosion.
- stress corrosion,
- biological corrosion,
- fretting corrosion,
- exfoliation corrosion.

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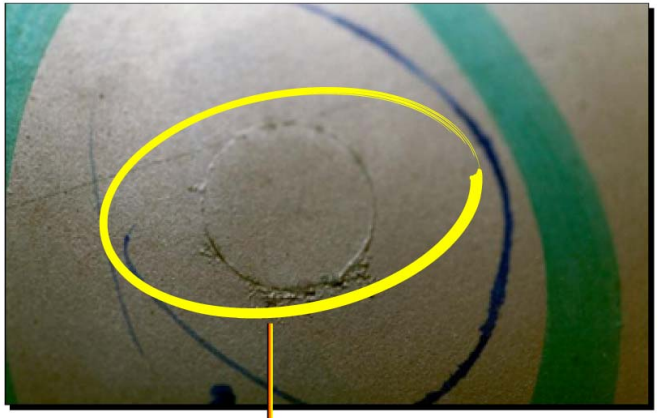
HEAVY CORROSION



CORROSION AROUND FASTENER HEAD

CORROSION IS THE DESTRUCTION OF METAL BY CHEMICAL OR ELECTROCHEMICAL EFFECT.

TYPES OF DAMAGE ON STRUCTURE - CORROSION

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

CORROSION (CONT'D)

This page deals with:
- pitting corrosion,
- filiform corrosion,
- intergranular corrosion,
- galvanic corrosion.

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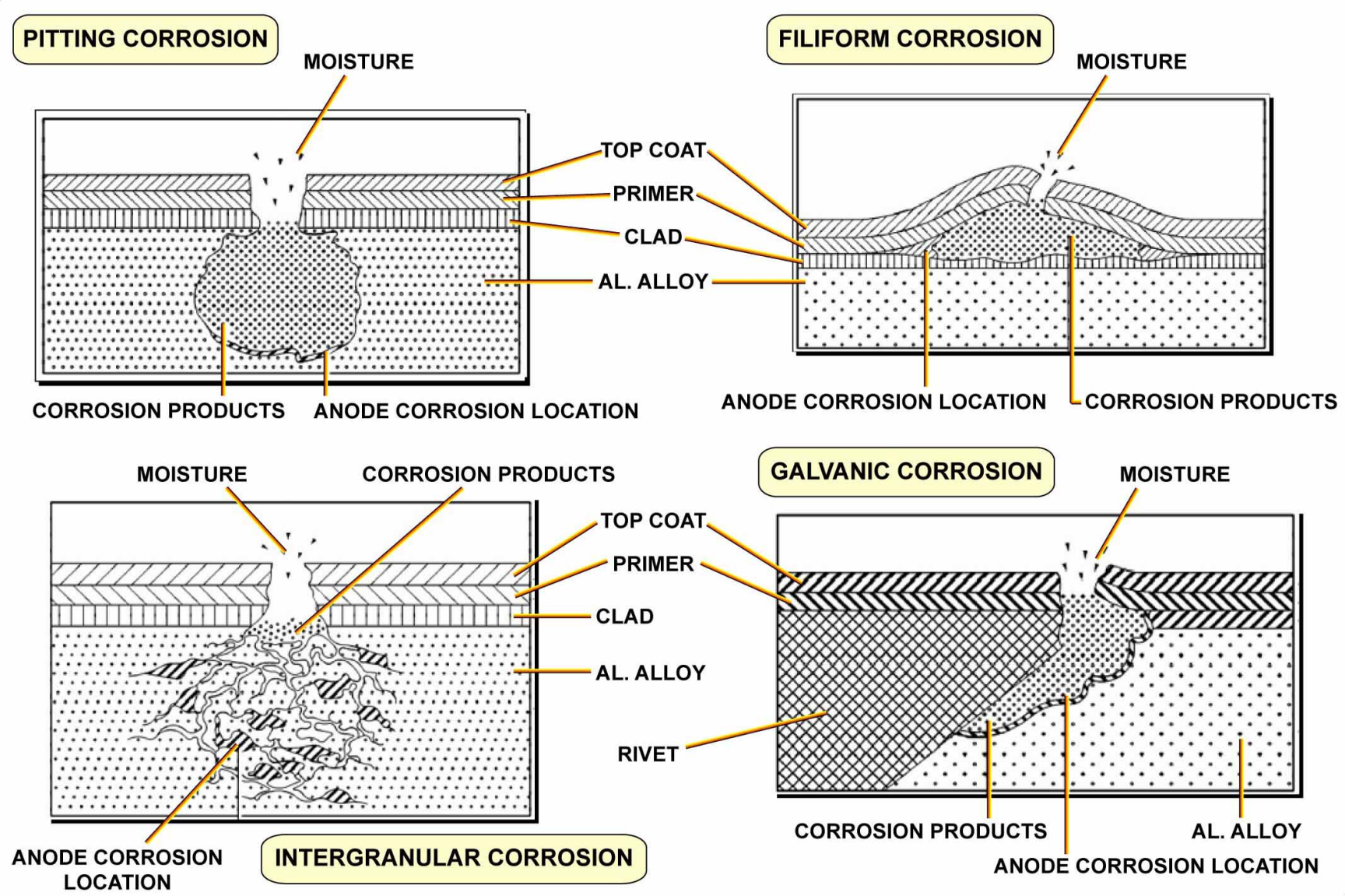

TYPES OF DAMAGE ON STRUCTURE - CORROSION (CONT'D)

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

CORROSION (CONT'D)

This page deals with:
- stress corrosion,
- biological corrosion,
- fretting corrosion,
- exfoliation corrosion.

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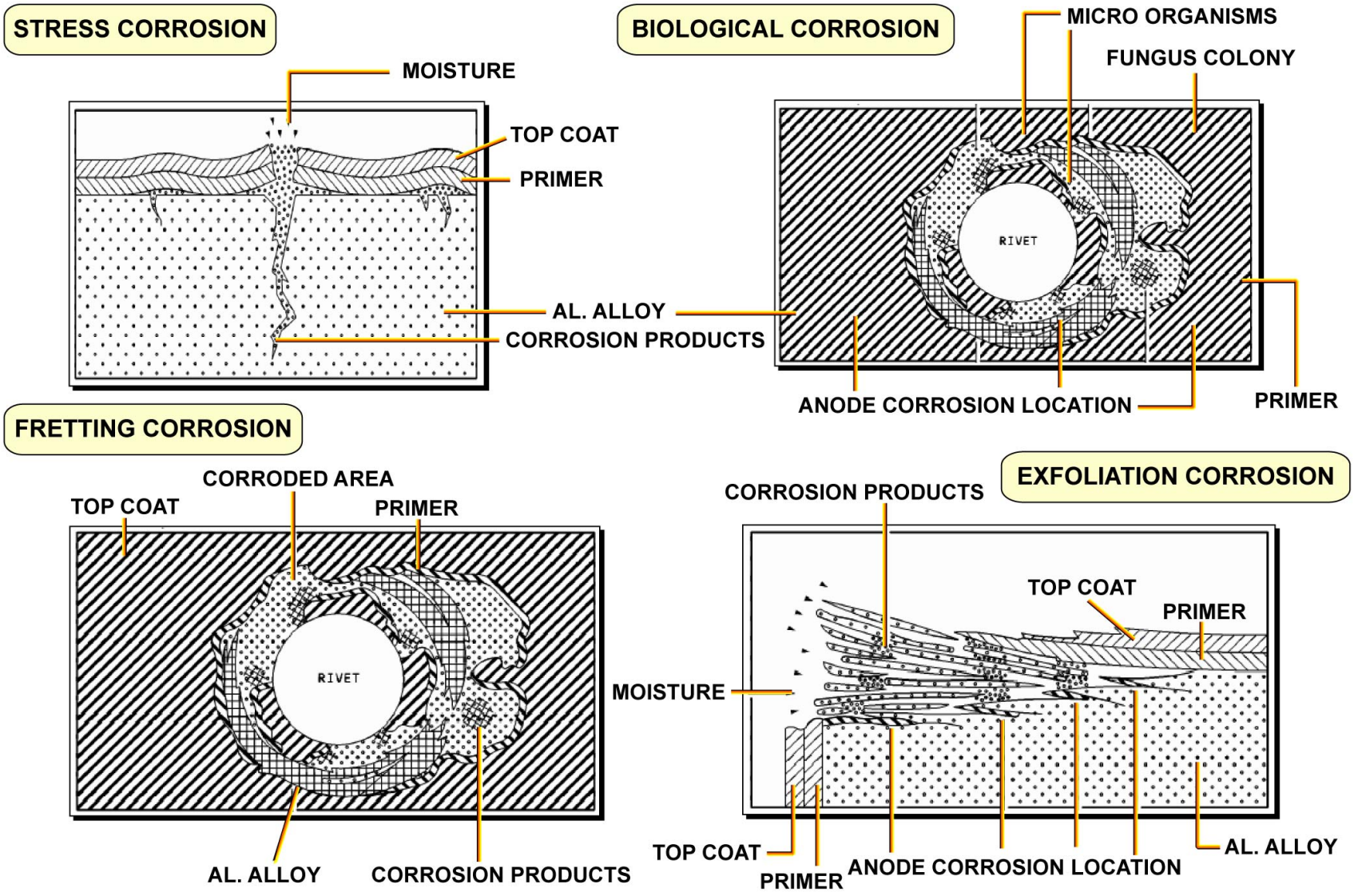


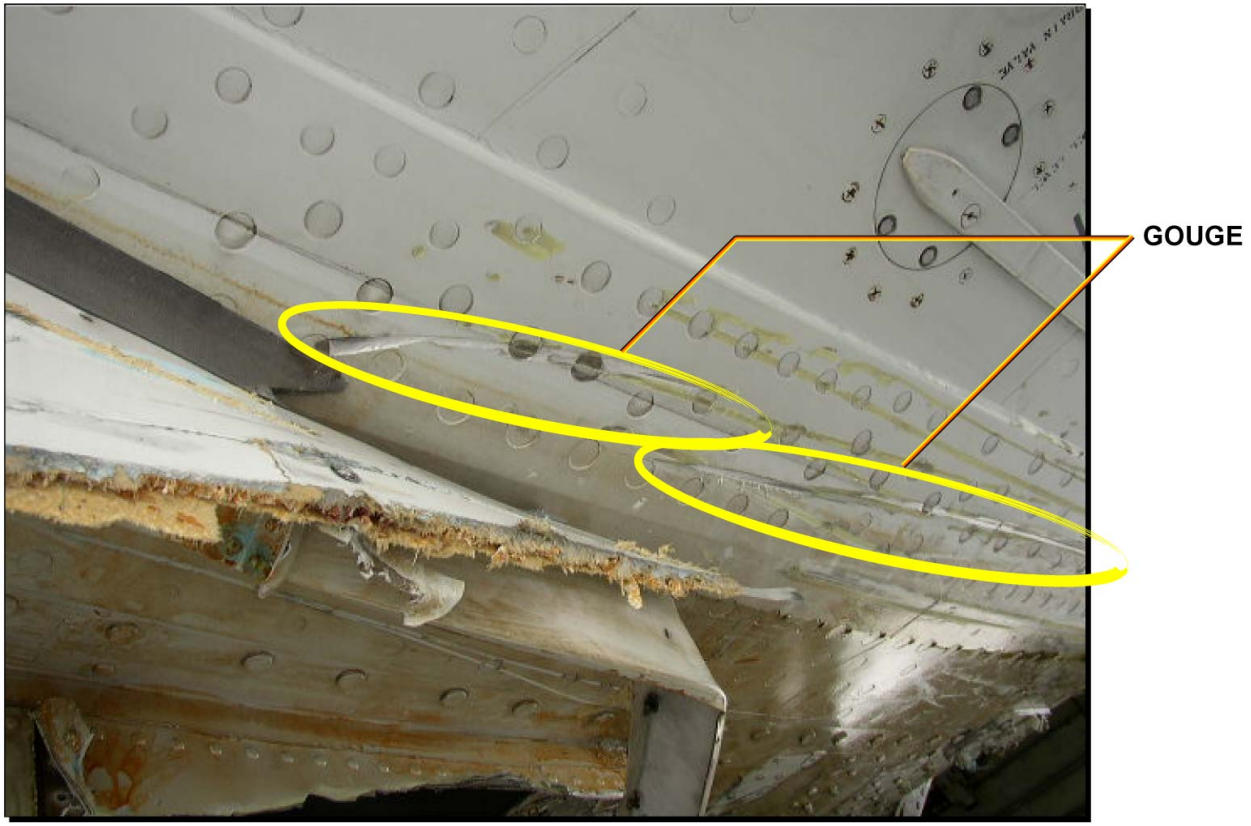
TYPES OF DAMAGE ON STRUCTURE - CORROSION (CONT'D)

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

GOUGE

A gouge is a damaged area of any size, which results in a cross sectional area change. It is usually caused by contact with a relatively sharp object, which produces a continuous, sharp or smooth channel like a groove in the material.



A GOUGE IS A DAMAGED AREA WHICH RESULTS IN A CROSS SECTIONAL AREA CHANGE PRODUCING A CONTINUOUS SHARP OR SMOOTH CHANNEL LIKE GROOVE IN THE MATERIAL.

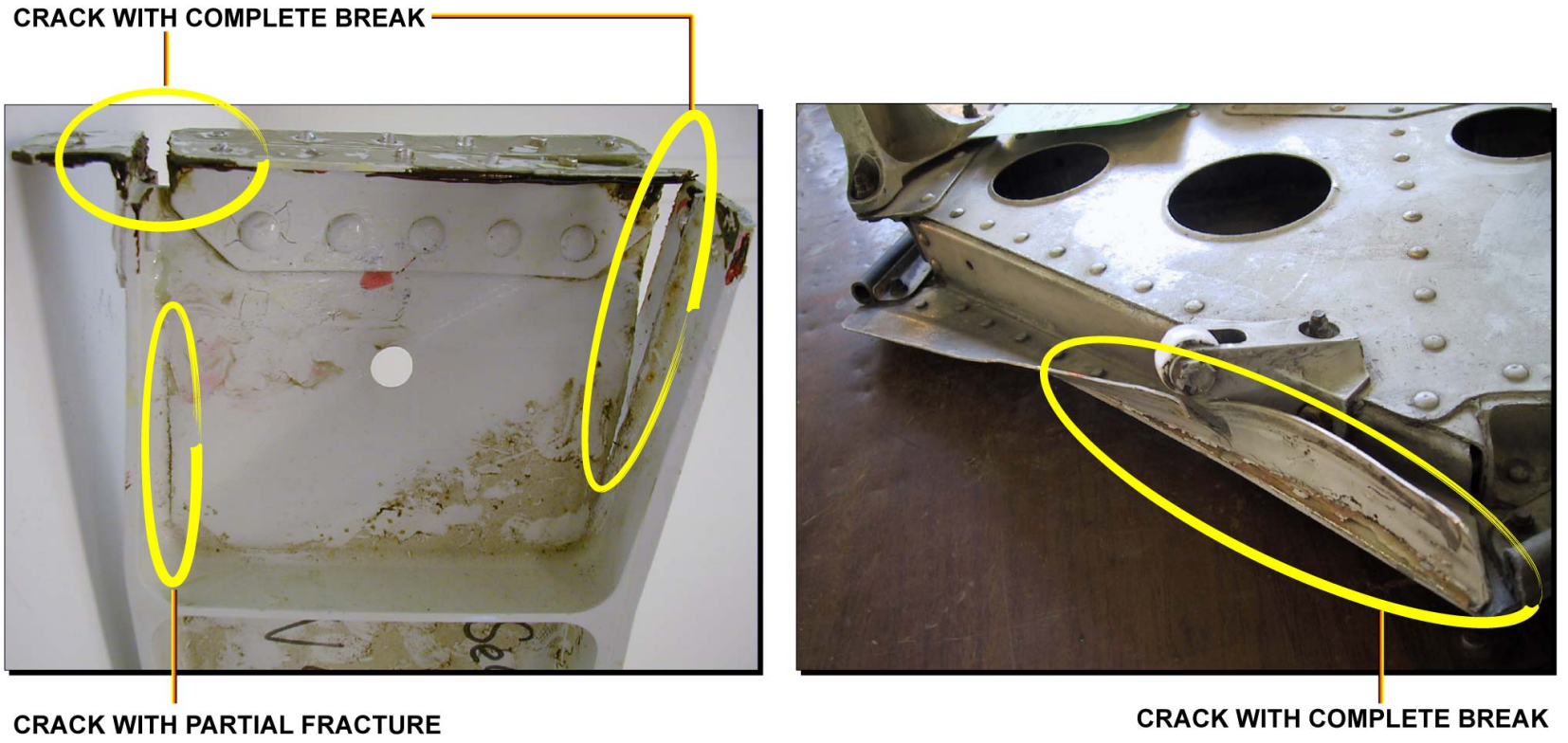
TYPES OF DAMAGE ON STRUCTURE - GOUGE

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

CRACK

A crack is a partial fracture or complete break in the material.



A CRACK IS A PARTIAL FRACTURE OR COMPLETE BREAK IN THE MATERIAL.

TYPES OF DAMAGE ON STRUCTURE - CRACK

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

DENT

A dent is a damaged area, which is pushed in, with respect to its usual contour. There is no cross sectional area change in the material. Edges of the damaged area are smooth.

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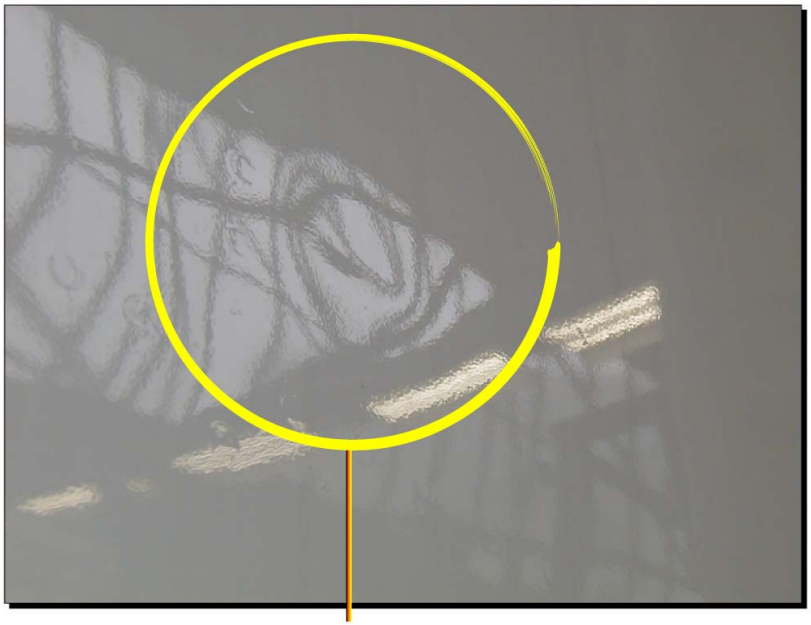
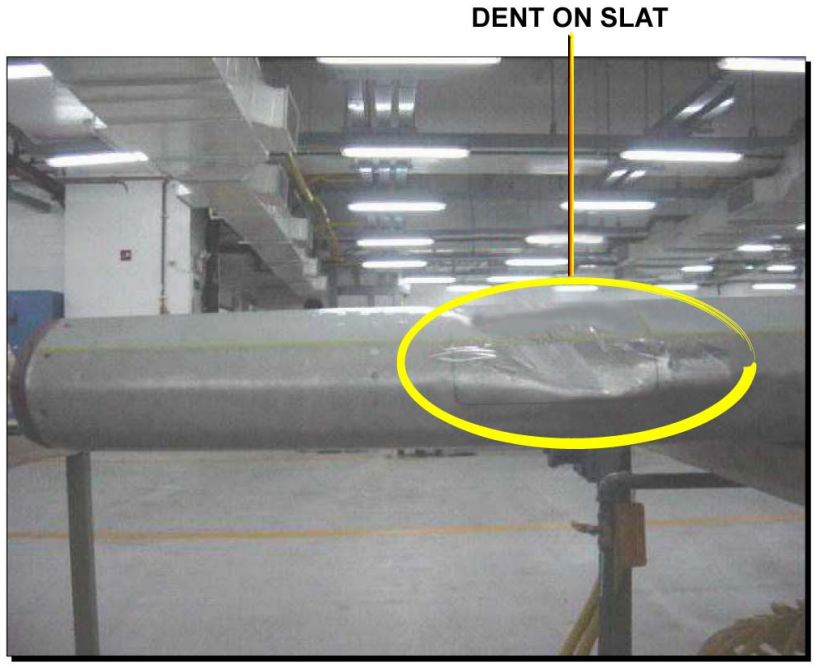




A DENT IS A DAMAGED AREA WHICH IS PUSHED IN, WITH RESPECT TO ITS USUAL CONTOUR WITH NO CROSS SECTIONAL AREA CHANGE IN THE MATERIAL.

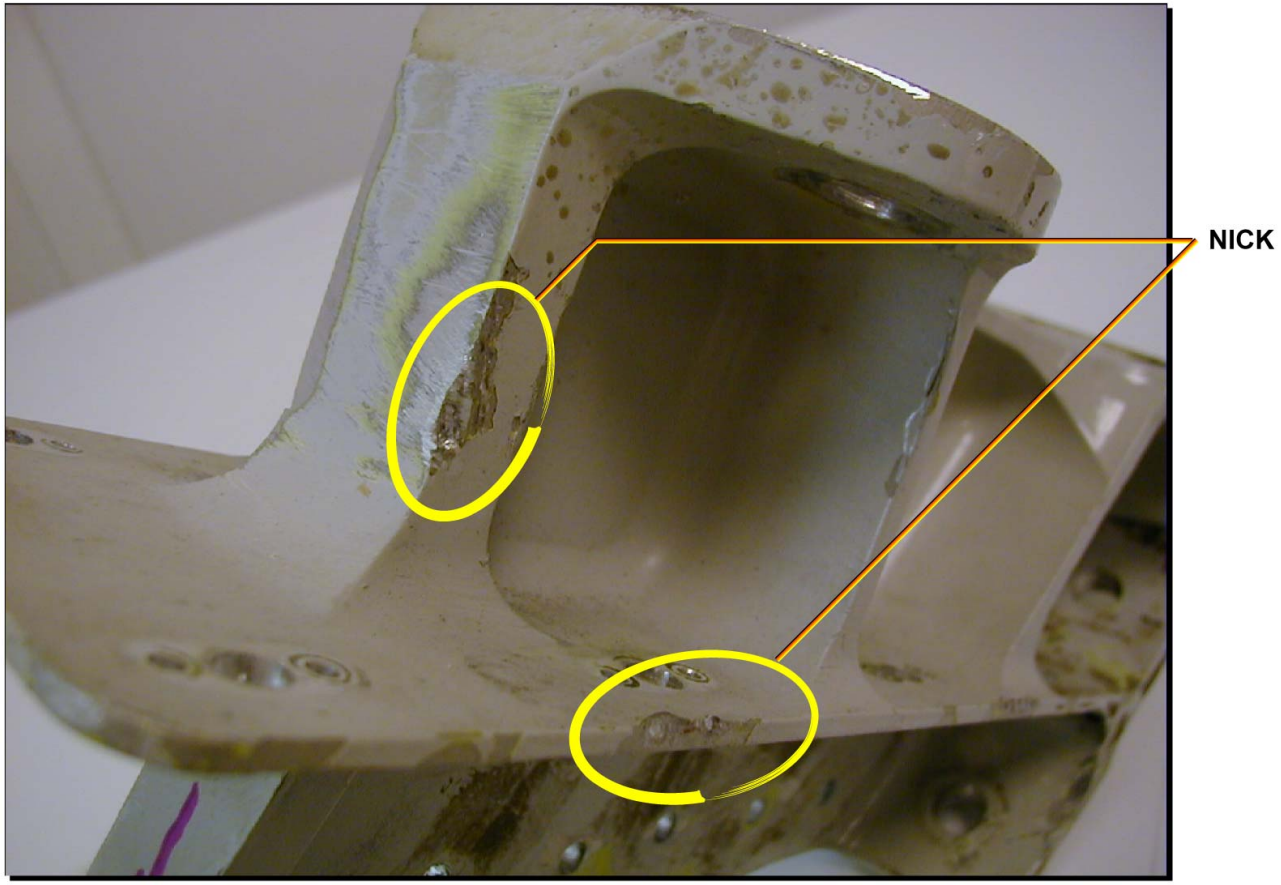
TYPES OF DAMAGE ON STRUCTURE - DENT

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

NICK

A nick is a small decrease of material due to, for example, a knock at the edge of a member or a skin.



A NICK IS A SMALL DECREASE OF MATERIAL DUE TO A KNOCK AT THE EDGE OF A MEMBER OR SKIN.

TYPES OF DAMAGE ON STRUCTURE - NICK

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

DISTORTION

A distortion is any twisting, bending or permanent strain, which results in misalignment or change of shape. It may be caused by an impact from a foreign object, but it is usually the result of a vibration or movement of adjacent attached components. This group includes bending, buckling, deformation, imbalance, misalignment, pinching, and twisting.

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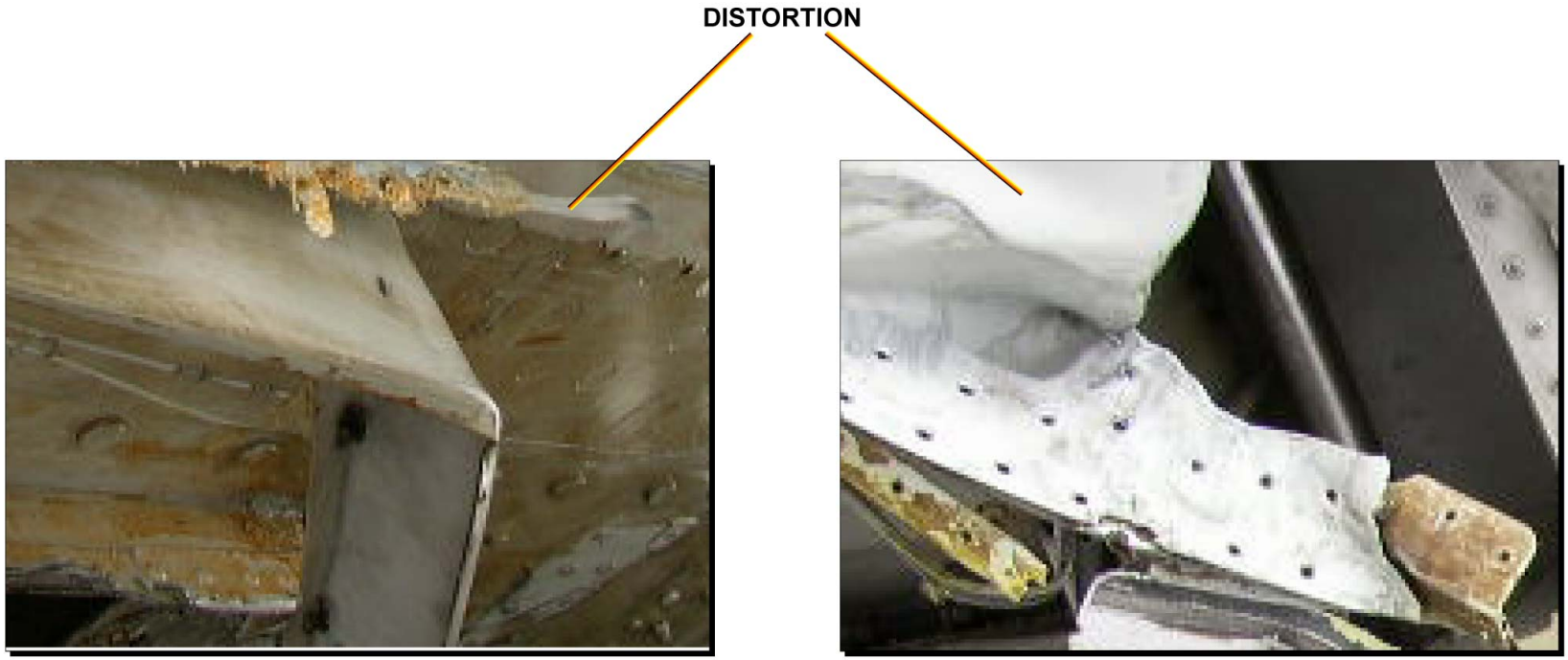

A DISTORTION IS ANY TWISTING, BENDING OR PERMANENT STRAIN WHICH RESULTS IN MISALIGNMENT, OR CHANGE OF SHAPE.

TYPES OF DAMAGE ON STRUCTURE - DISTORTION

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

ABRASION

An abrasion is a damaged area of any size which causes change in a cross sectional area because of scuffing, rubbing, scrapping or other surface erosion. It is usually rough and irregular.

EROSION ON VERTICAL STABILIZER LEADING EDGE

AN ABRASION IS A DAMAGED AREA WHICH CAUSES CHANGE IN A CROSS SECTIONAL AREA BECAUSE OF SCUFFING, RUBBING, SCRAPPING OR OTHER SURFACE EROSION.

TYPES OF DAMAGE ON STRUCTURE - ABRASION

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

DEBONDING

Debonding is the separation of material due to an adhesive failure.

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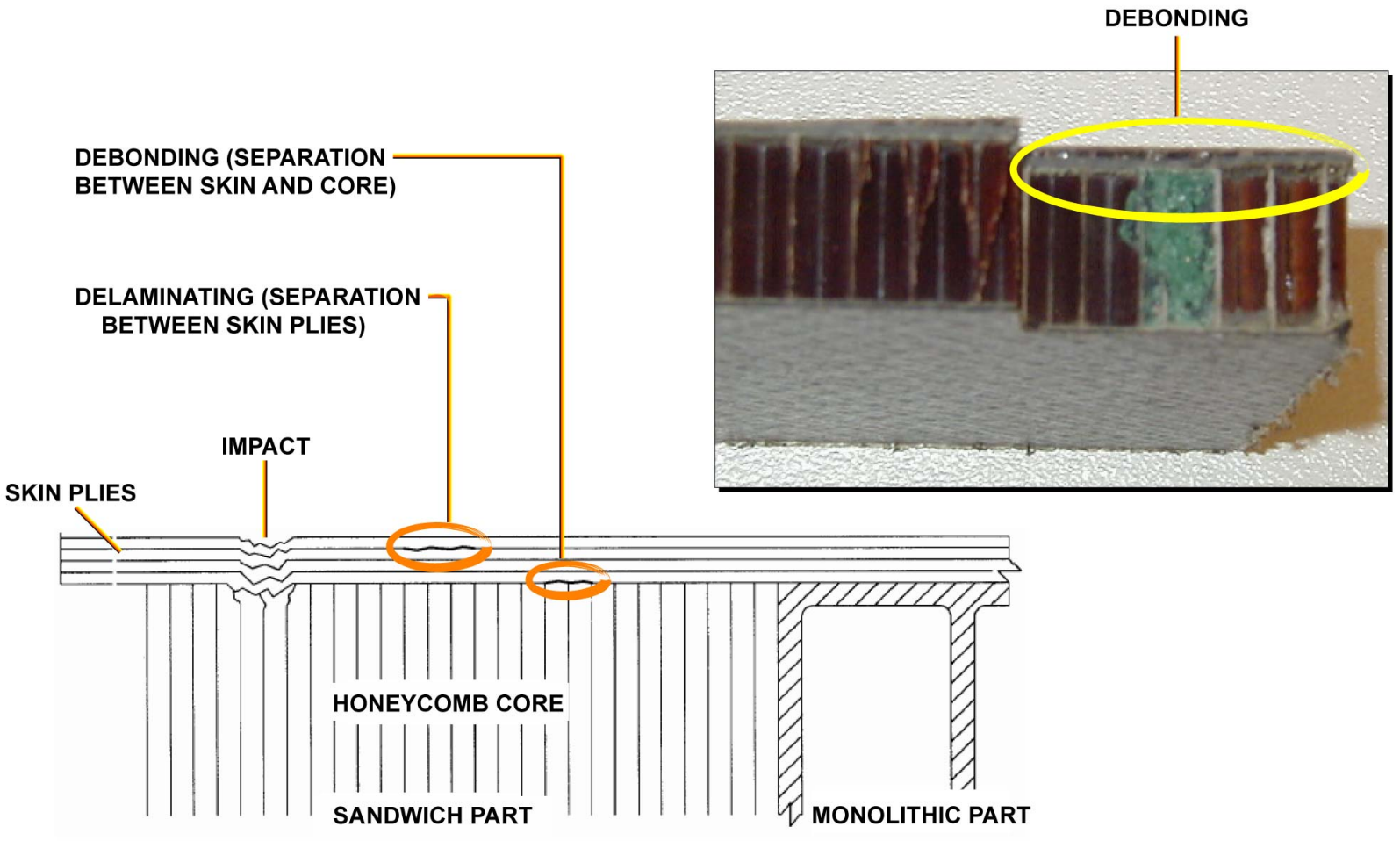

DEBONDING IS THE SEPARATION OF MATERIALS DUE TO AN ADHESIVE FAILURE.

TYPES OF DAMAGE ON STRUCTURE - DEBONDING

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

DELAMINATING

A Delaminating is when a separation of plies occurs in multi-laminate material. This damage can be the result of hits done onto the material or when there is a resin failure caused by other reasons.

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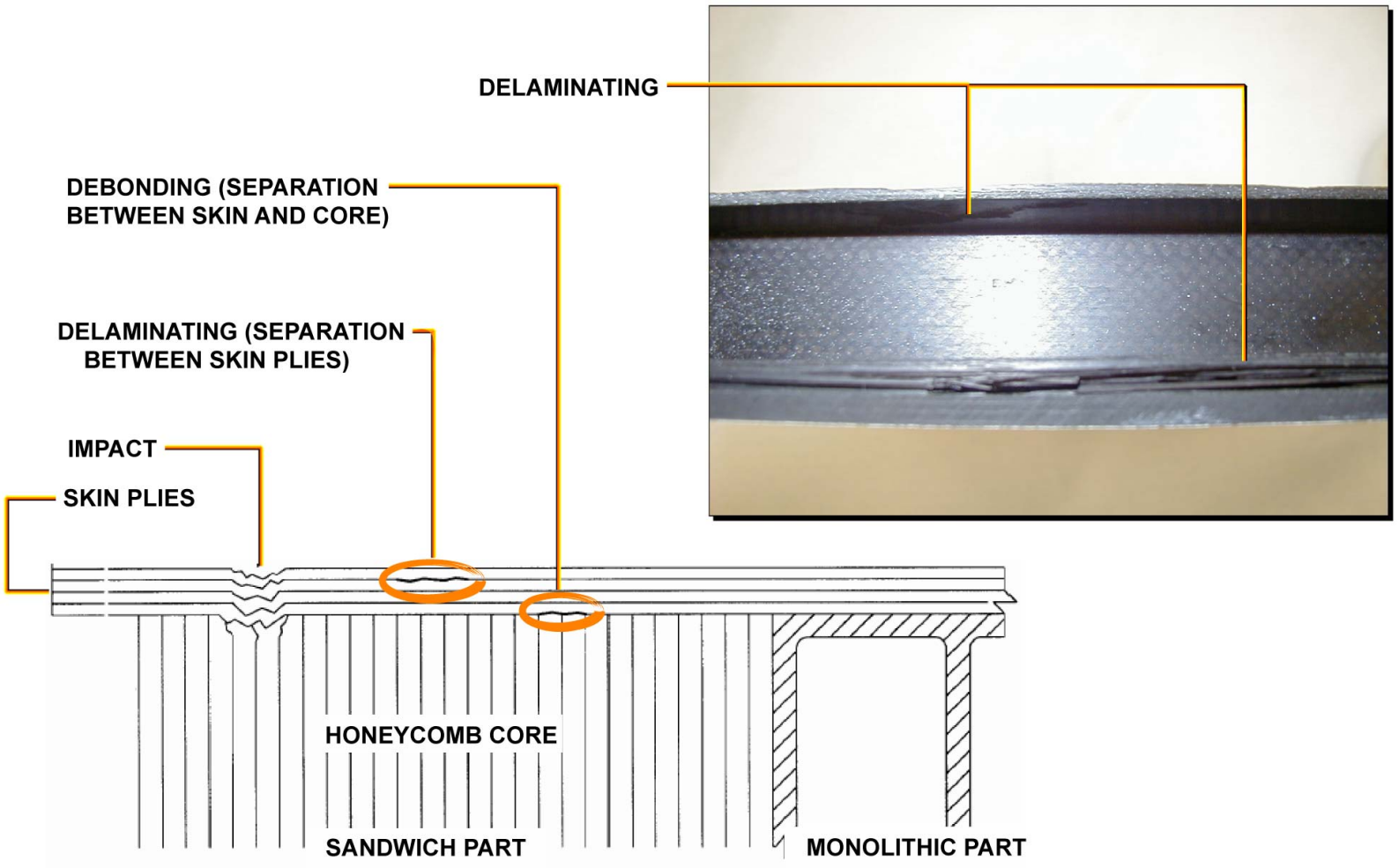


DELAMINATING IS THE SEPARATION OF PLIES IN MULTI-LAMINATE MATERIAL.

TYPES OF DAMAGE ON STRUCTURE - DELAMINATING

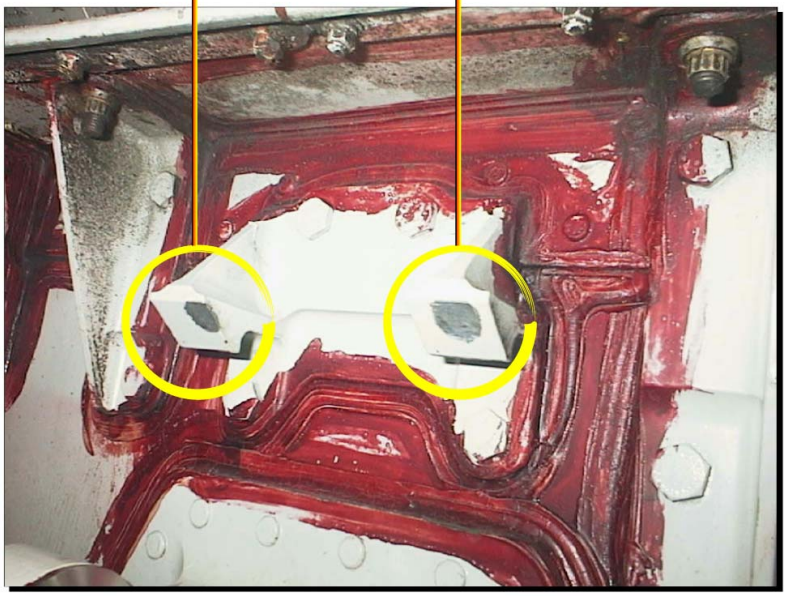
STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

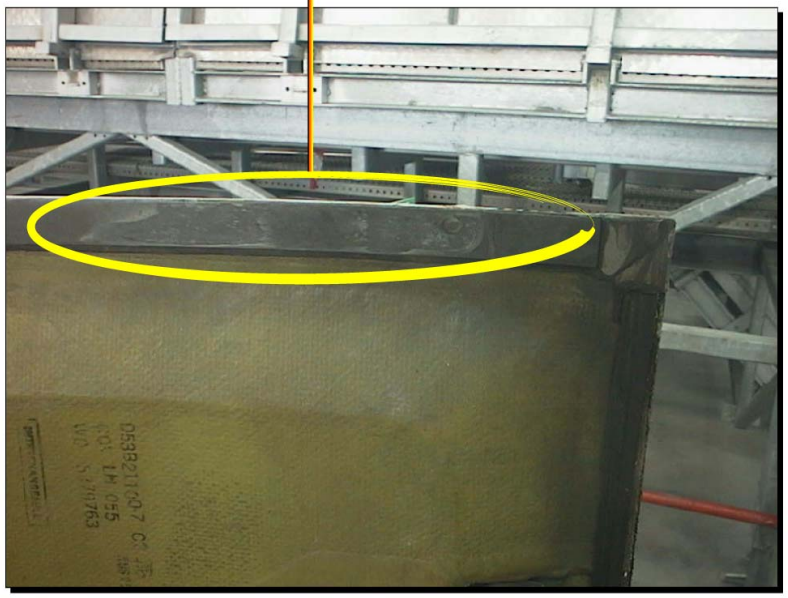
FRETTING

A fretting is a surface damage at the interface between elements of the joints resulting from very small angular or linear movements. The result of fretting is usually the production of fine black powder staining.

FRETTING ON CARGO DOOR STOP FITTING



FRETTING



FRETTING IS A SURFACE DAMAGE AT THE INTERFACE BETWEEN ELEMENTS OF THE JOINTS RESULTING FROM ANGULAR OR LINEAR MOVEMENTS.

TYPES OF DAMAGE ON STRUCTURE - FRETTING

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

CREASE

A crease is a damaged area, which is pushed in or folded back on itself. The edges of the damaged area are sharp or well-specified lines or ridges.

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CREASE

A CREASE IS A DAMAGED AREA WHICH IS PUSHED IN OR FOLDED BACK ON ITSELF. THE EDGES ARE SHARP OR WELL SPECIFIED LINES OR RIDGES.

TYPES OF DAMAGE ON STRUCTURE - CREASE

STRUCTURE DAMAGE IDENTIFICATION D/O (3)

TYPES OF DAMAGE ON STRUCTURE (continued)

MARK

A mark is a damaged area of any size where a concentration of scratches, nicks, chips, burrs or gouges etc. is shown. You must consider the damage as an area and not as a series of individual scratches, gouges, etc.

MARK

A MARK IS A DAMAGED AREA OF ANY SIZE WHERE A CONCENTRATION OF SCRATCHES, NICKS, CHIPS, BURRS, OR GOUGES, ... IS SHOWN.

TYPES OF DAMAGE ON STRUCTURE - MARK

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

GENERAL

The structure repair manual is a non-customized document.
It has been prepared in accordance with Air Transport Association of America (ATA) specification 100.
The SRM includes descriptive information as well as specific instructions and data to perform the assessment of structural damage and to perform repairs. The manual content is approved by the European Airworthiness Authority EASA ("European Aviation Safety Agency").
For most of the damage/defect discovered on the aircraft structure, the SRM is the first document to be used to assess the damage, to identify the affected structure and to determine the subsequent action or repair to be performed.

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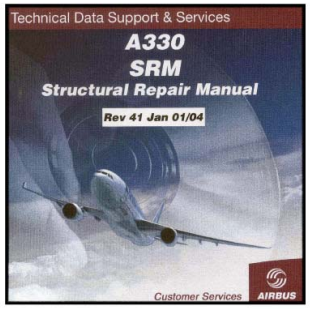

NON CUSTOMIZED DOCUMENT

PREPARED IN ACCORDANCE WITH THE
AIR TRANSPORT ASSOCIATION (ATA), SPECIFICATION 100

EASA (European Aviation Safety Agency) APPROVED DOCUMENT

MAIN CONTENTS:
- STRUCTURE PART IDENTIFICATION,
- ALLOWABLE DAMAGE,
- STRUCTURAL REPAIRS,
- MATERIAL AND FASTENER INFORMATION.

AIRBUS

A330

STRUCTURAL REPAIR MANUAL

SRM

APPROVED BY EASA

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Reference: F SRM 001 Issue: Nov 93

GENERAL

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

MANUAL BREAKDOWN

The SRM is divided in several chapters. The manual begins with some front pages providing some general information (HIGHLIGHTS, RECORD OF REVISIONS...). The Introduction chapter (CHAPTER 00) contains all the necessary information for manual usage.
The alphanumerical Index provides a quick access to the part identification using the partnumber as the entry point.
The SRI (Structure Repair Inspections) chapter has to be used only when a post-repair inspection program is required in the repair instructions.
The chapter 51 contains all the repair standards practices, materials, fasteners information.
The chapters 52 to 57 are the specific chapters containing the identification of the individual parts, the related allowable damage information and the available repair instructions.

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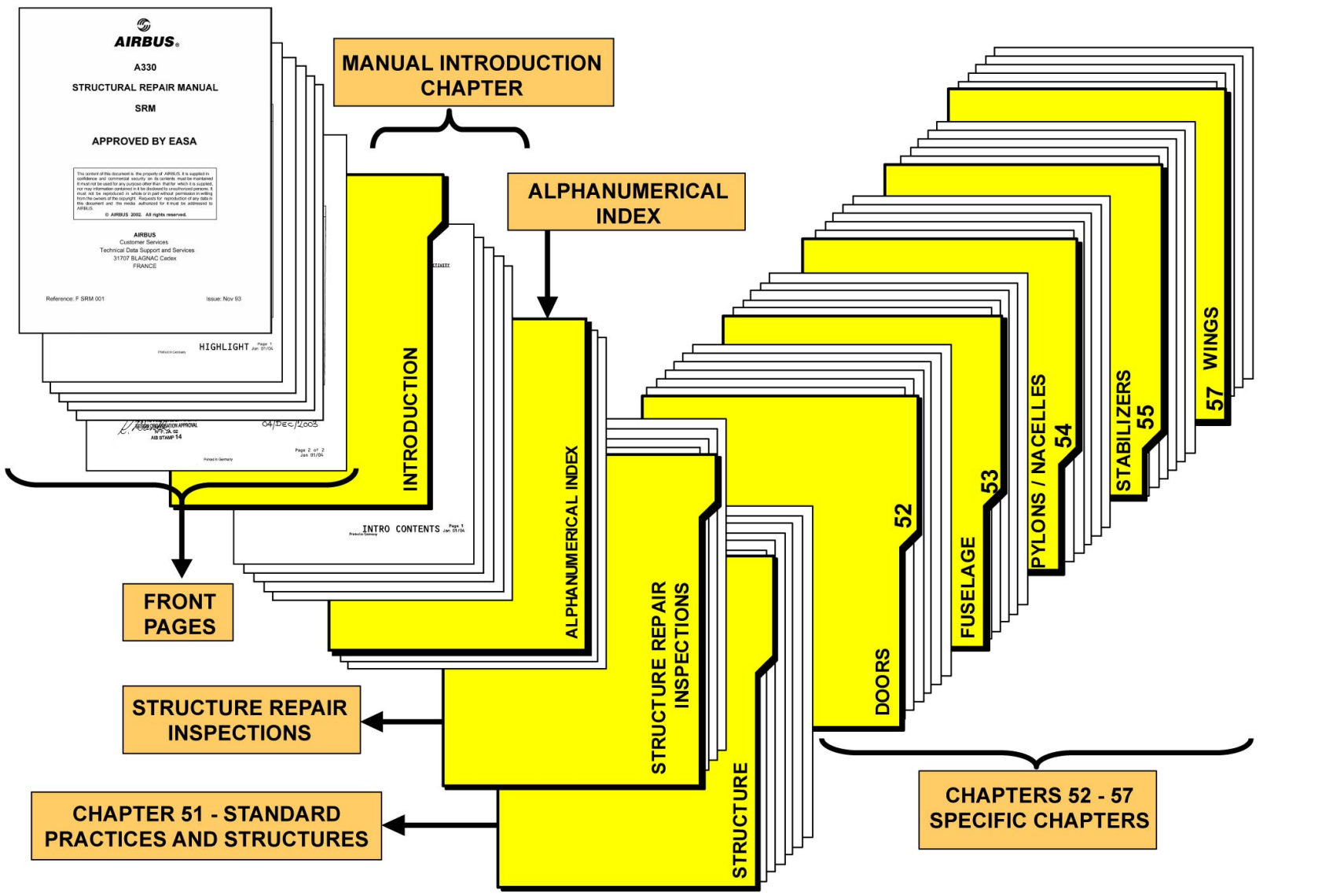
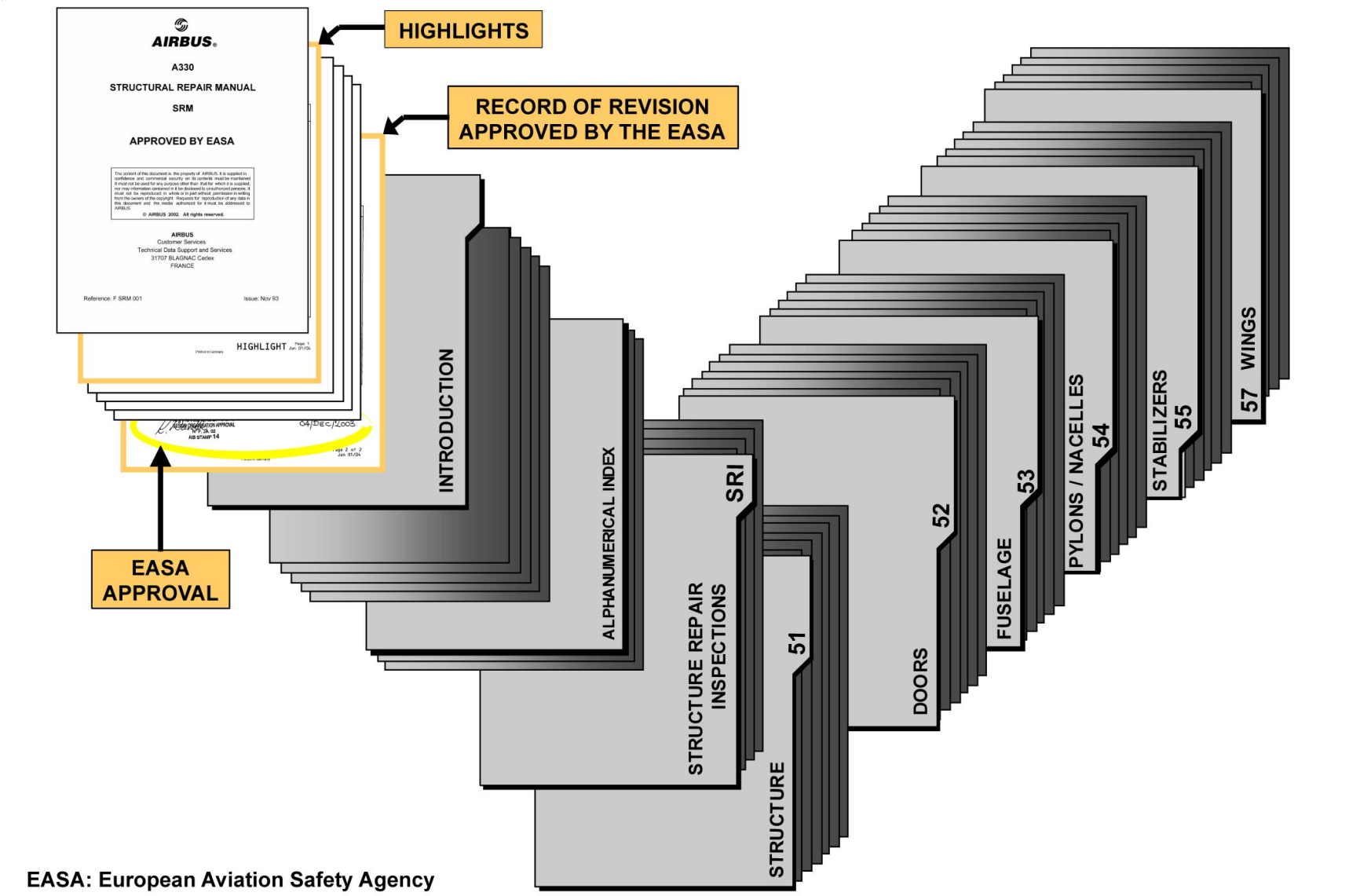


MANUAL BREAKDOWN

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

FRONT PAGES

The front pages of the manual provides general information related to the manual itself:
- the revision transmittal sheet,
- "highlights" pages which identify the modifications from the previous manual revision.
- the record of revisions approved,
and the record of temporary revisions,


AIRBUS
A330
STRUCTURAL REPAIR MANUAL
SRM
APPROVED BY EASA
AIRBUS
Customer Services
Technical Data Support and Services
31707 BLAGNAC Cedex
FRANCE
Reference: F SRM 001
Issue: Nov 93
HIGHLIGHT
HIGHLIGHTS
RECORD OF REVISION APPROVED BY THE EASA
EASA APPROVAL
04/Dec/2003
INTRODUCTION
ALPHANUMERICAL INDEX
SRI
STRUCTURE REPAIR INSPECTIONS
51 STRUCTURE
52 DOORS
53 FUSELAGE
54 PYLONS / NACELLES
55 STABILIZERS
57 WINGS
EASA: European Aviation Safety Agency

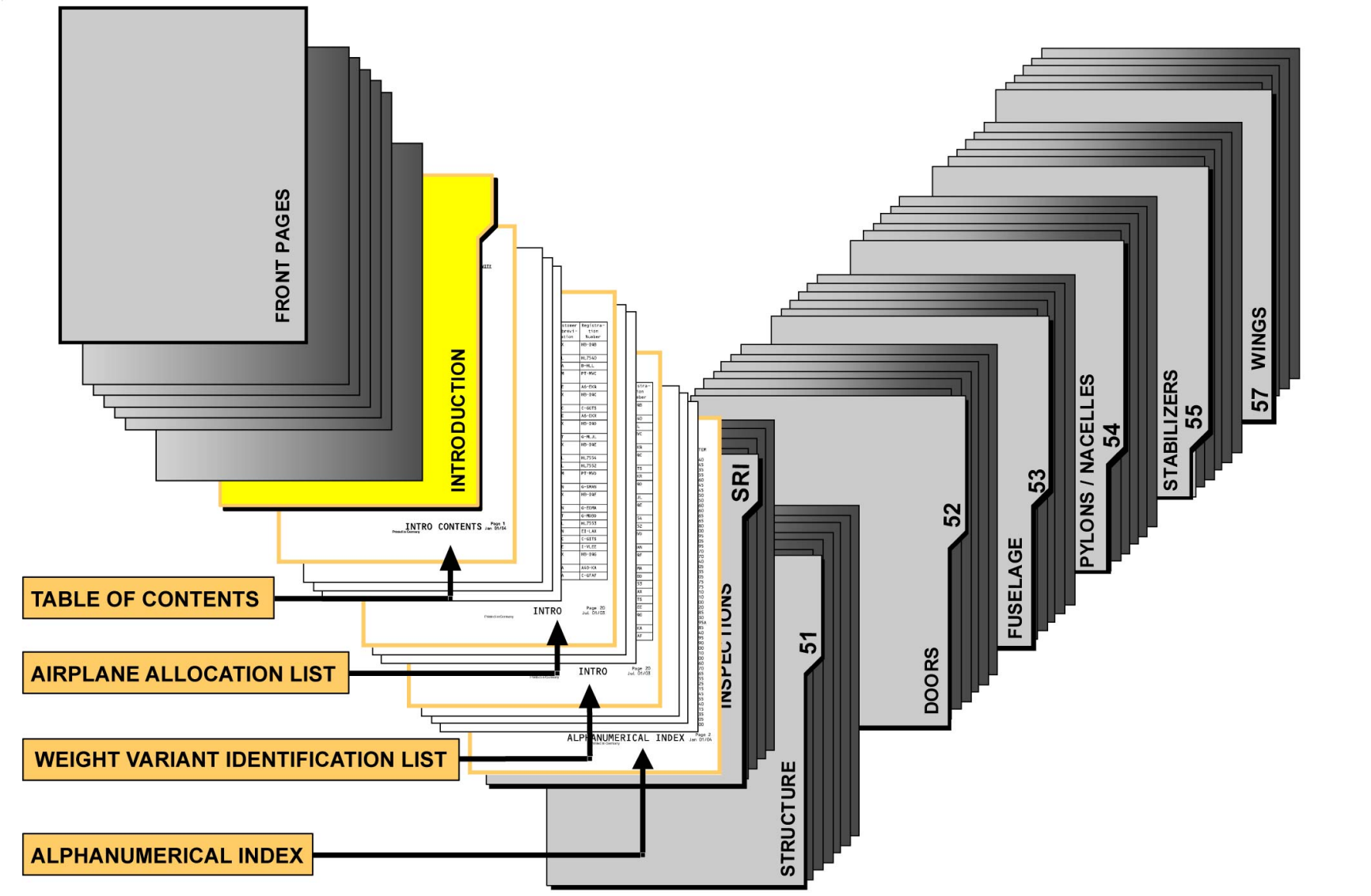
FRONT PAGES

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

INTRODUCTION CHAPTER

The introduction chapter contains all necessary information and explanations to enable a correct use of the manual. It also include the aircraft allocation list and the aircraft weight variant identification.

G4J06491 - G0UT1M0 - FM51DZ000000001



INTRODUCTION CHAPTER

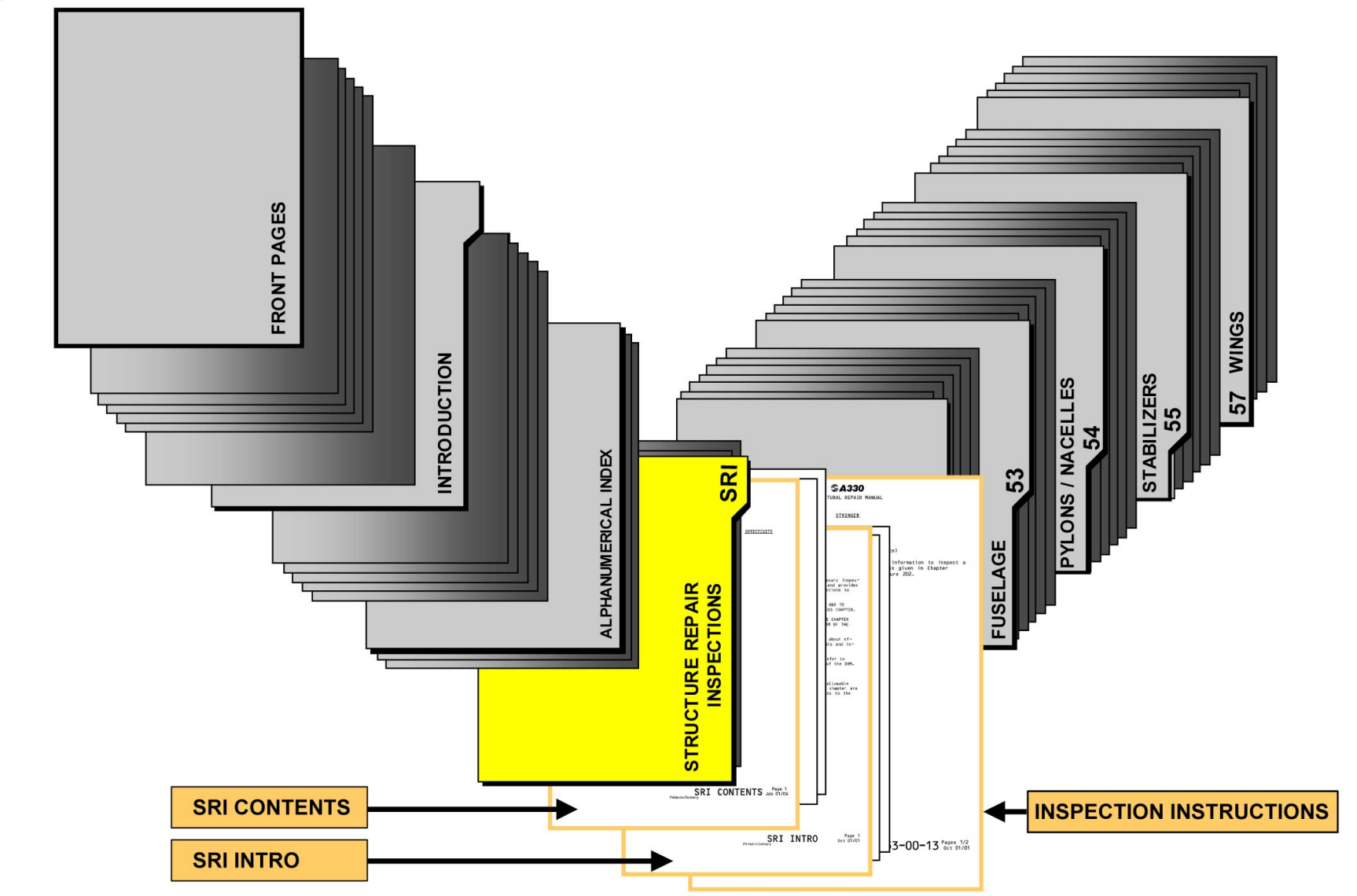
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

STRUCTURAL REPAIR INSPECTIONS (SRI) CHAPTER

For permanent repairs with inspection program, inspections are quoted along with the repair.
Due to the amount of common inspection methods, these requirements have been transferred in a separate appendix to the SRM:
- for more clarity of the SRM,
- for better handling of the inspection requirements.

The chapter Structural Repair Inspections (SRI) gives all necessary inspection instructions on structural damage, threshold and intervals.

G4J06491 - G0UT1M0 - FM51DZ000000001



STRUCTURAL REPAIR INSPECTIONS (SRI) CHAPTER

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

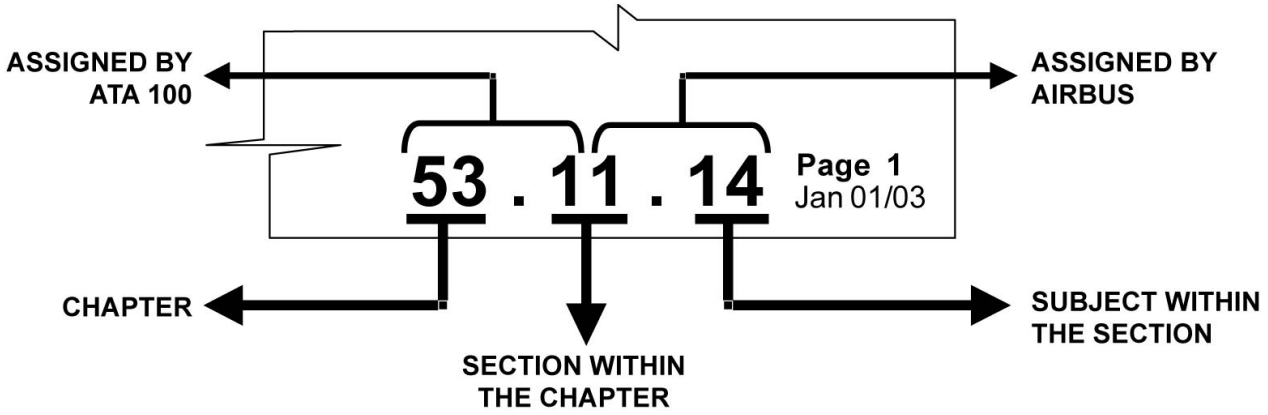
NUMBERING SYSTEM AND PAGE BLOCK ALLOCATION

Numbering system:
Each subject, within the SRM, is identified using a three-element numbering system chapter/section and sub-section.
- the first element designates the chapter which is assigned by the ATA spec. 100,
- the second element designates the section within the chapter. The first digit is assigned by the ATA spec. 100. The second digit is assigned by Airbus S.A.S,
- the third element identifies the sub-section (subject) within the section and is assigned by Airbus S.A.S.

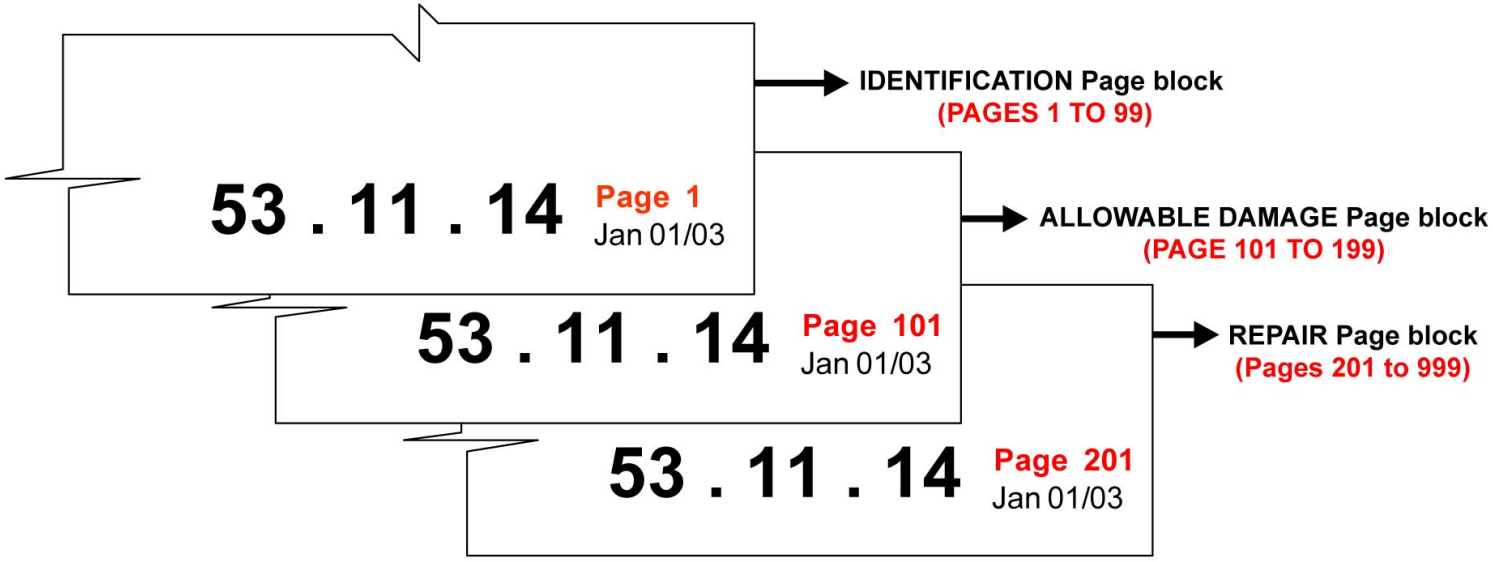
A standard page block allocation is used for all SRM chapters.
- pages 1 to 99 for structure identification,
- pages 101 to 199 for allowable damage,
- pages 201 to 999 for repairs.

G4J06491 - G0UT1M0 - FM51DZ000000001

NUMBERING



PAGE BLOCK ALLOCATION



NUMBERING SYSTEM AND PAGE BLOCK ALLOCATION

G4J06491 - G0UT1M0 - FM51DZ000000001

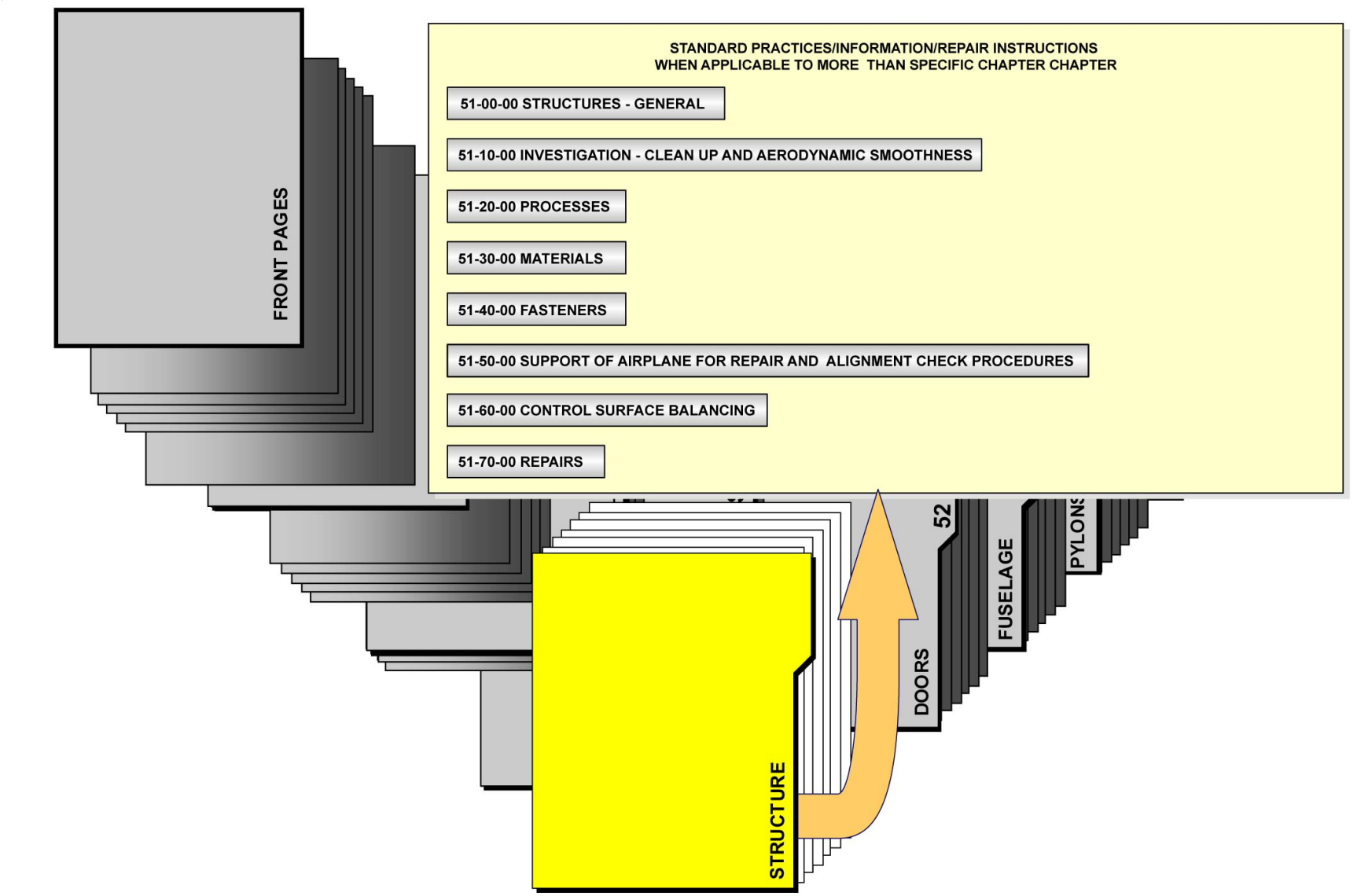
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 51 (STANDARD PRACTICES AND STRUCTURES)

Information of a general nature or information applicable to more than one chapter, is included in chapter 51.

NOTE: REMINDER: the entry point within the SRM is always the specific chapter 52 to 57, depending on the affected part.

G4J06491 - G0UT1M0 - FM51DZ000000001



CHAPTER 51 (STANDARD PRACTICES AND STRUCTURES)

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS

LAYOUT

Chapters 52 to 57 all have the same layout, which conforms to the defined page block allocation system (PB 01 to 99 - identification, PB 101 to 199 - allowable damage, PB 201 to 999 - repairs). In addition, a table of contents and a Service Bulletin (SB) list are provided at the beginning of each chapter. Depending on the chapters, the Modification/Service Bulletin list is to be found either at the chapter level, or main section level.

For a correct identification of the individual parts the Identification page block and the Modification/Service Bulletin list have to be used together.

Once identified the applicable allowable damage information will be used to define whether a repair or a corrective action is required or not before releasing the aircraft.

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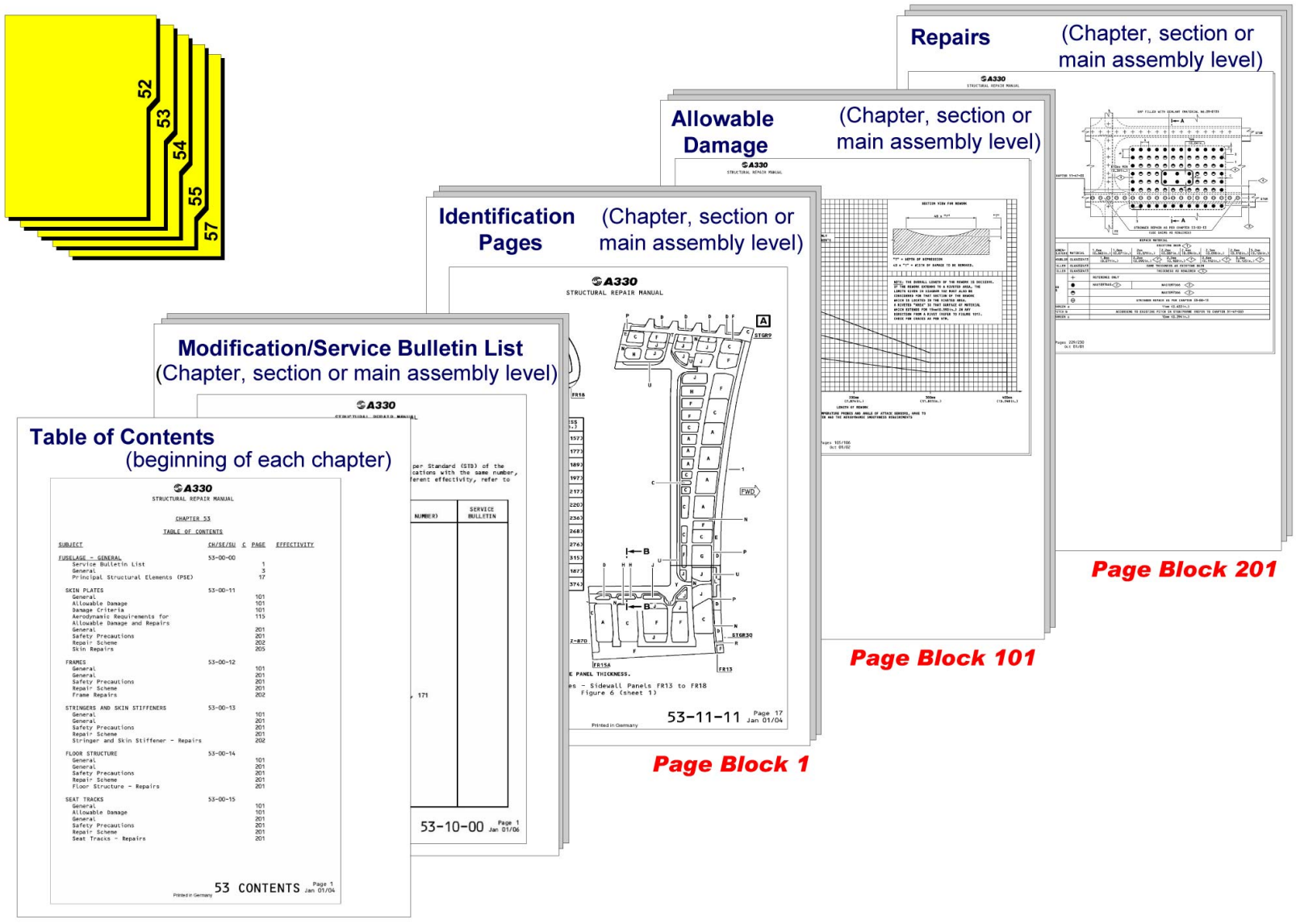


CHAPTER 52 TO 57 CONTENTS - LAYOUT

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

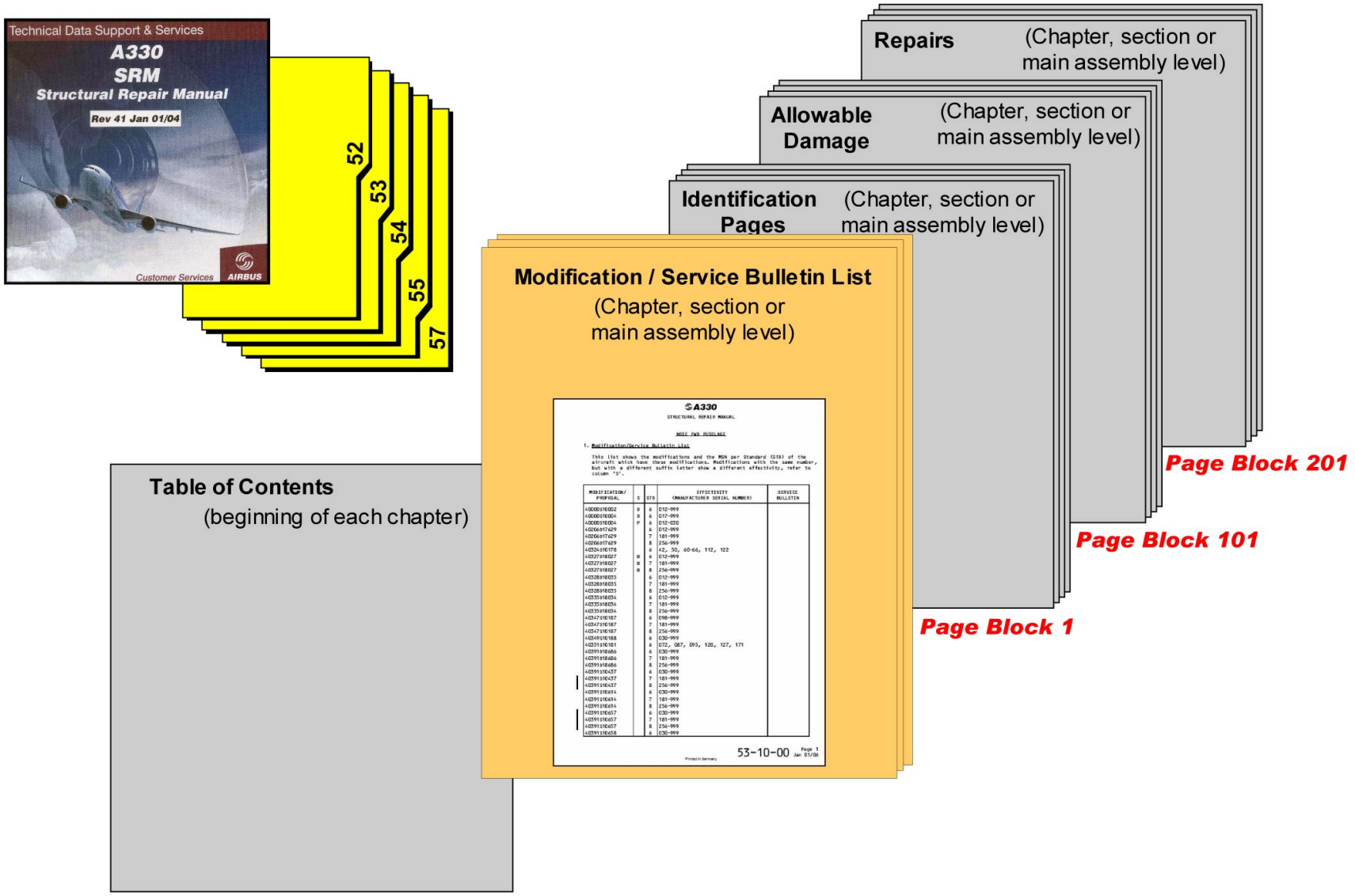
CHAPTER 52 TO 57 CONTENTS (continued)

MODIFICATION/SERVICE BULLETIN LIST

Located at:

The Modification / Service Bulletin list have to be used in close relation with the identification page block. It is used to define the effectivity in terms of MSN (Manufacturer Serial Number) of the structure parts. Since several versions of a same part can be available within the identification pages according a modification status.

G4J06491 - G0UT1M0 - FM51DZ000000001



CHAPTER 52 TO 57 CONTENTS - MODIFICATION/SERVICE BULLETIN LIST

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS (continued)

MODIFICATION/SERVICE BULLETIN LIST (CONT'D)

This list provides, for a given modification number, its associated suffix and the aircraft standard, and the effectivity expressed in MSN (Manufacturer Serial Number).

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A330

STRUCTURAL REPAIR MANUAL

EFFECTIVITY OF THE MODIFICATION IN MSN NUMBERS
(REF. : AIRCRAFT ALLOCATION TABLES IN SRM INTRODUCTION PART)

LOCATION WITHIN THE CHAPTER:

52: DOOR LEVEL
53: FUSELAGE SECTION LEVEL
54: CHAPTER LEVEL
55: MAIN ASSEMBLY LEVEL
57: WING SECTION LEVEL

1. Modification/Service Bulletin List

This list shows the modifications and the MSN per Standard (STD) of the aircraft which have these modifications. Modifications with the same number, ... different effectivity, refer to

SUFFIX COLUMN:
IDENTIFIES THE DIFFERENT EFFECTIVITY OF A SAME MODIFICATION

MODIFICATION/ PROPOSAL	S	STD	EFFECTIVITY (MANUFACTURER SERIAL NUMBER)	SERVICE BULLETIN
40000S10004	D	6	017-999	
40000S10004	P	6	012-030	
40327D18027	B	6	012-999	
40327D18027	B	7	181-999	
40327D18027	B	8	256-999	
40328D18035		6	012-999	
40328D18035		7	181-999	
40328D18035		8	256-999	

CORRESPONDING SB IF ANY

MODIFICATION NUMBER

CONCERNED A/C STANDARD

CHAPTER 52 TO 57 CONTENTS - MODIFICATION/SERVICE BULLETIN LIST (CONT'D)

G4J06491 - G0UT1M0 - FM51DZ000000001

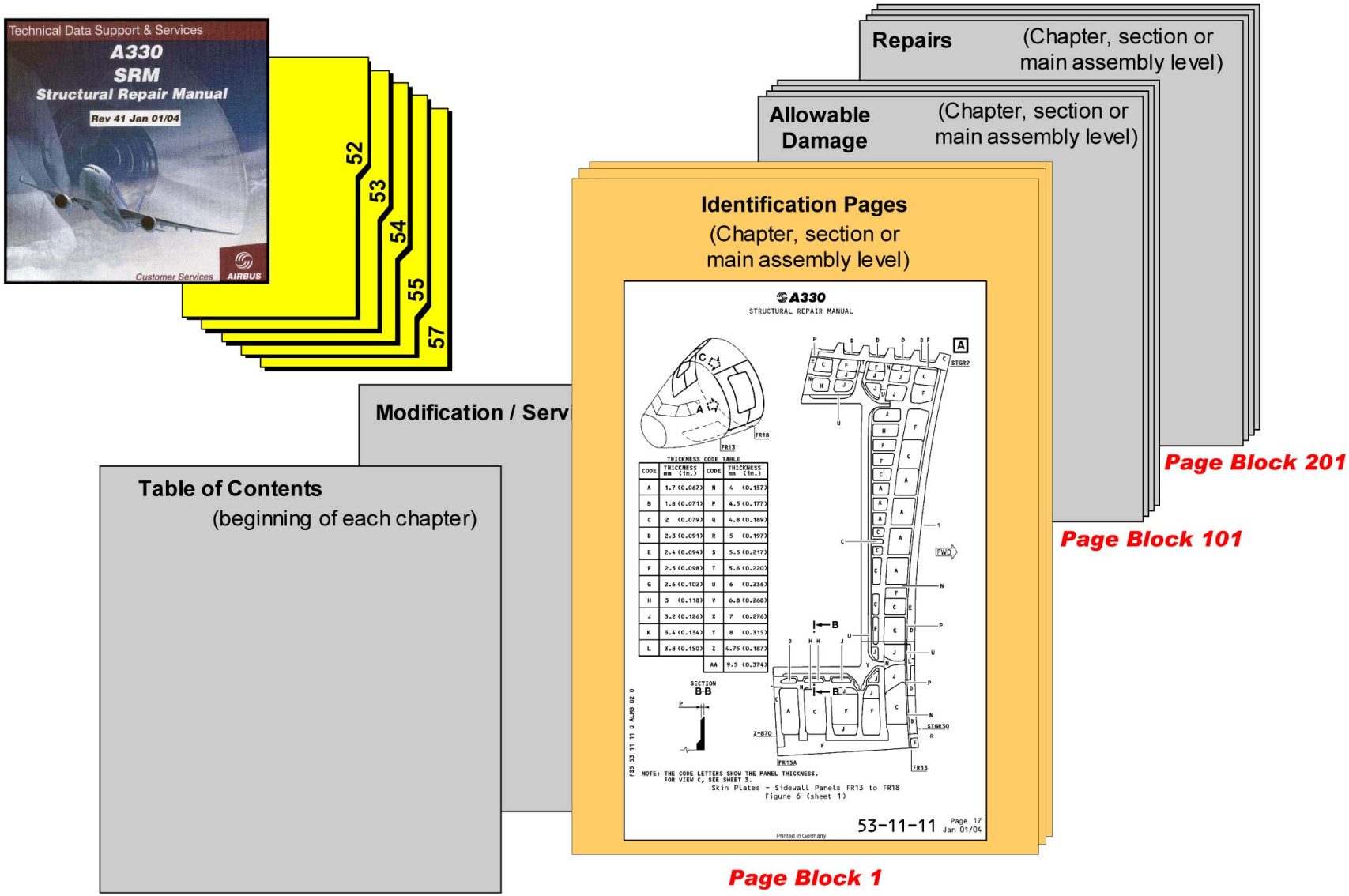
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS (continued)

IDENTIFICATION PAGES

In the identification pages, the individual parts of the major components are illustrated and listed in tabular form. Each identification topic begins with an introduction page, which includes a general information paragraph.

G4J06491 - G0UT1M0 - FM51DZ000000001



CHAPTER 52 TO 57 CONTENTS - IDENTIFICATION PAGES

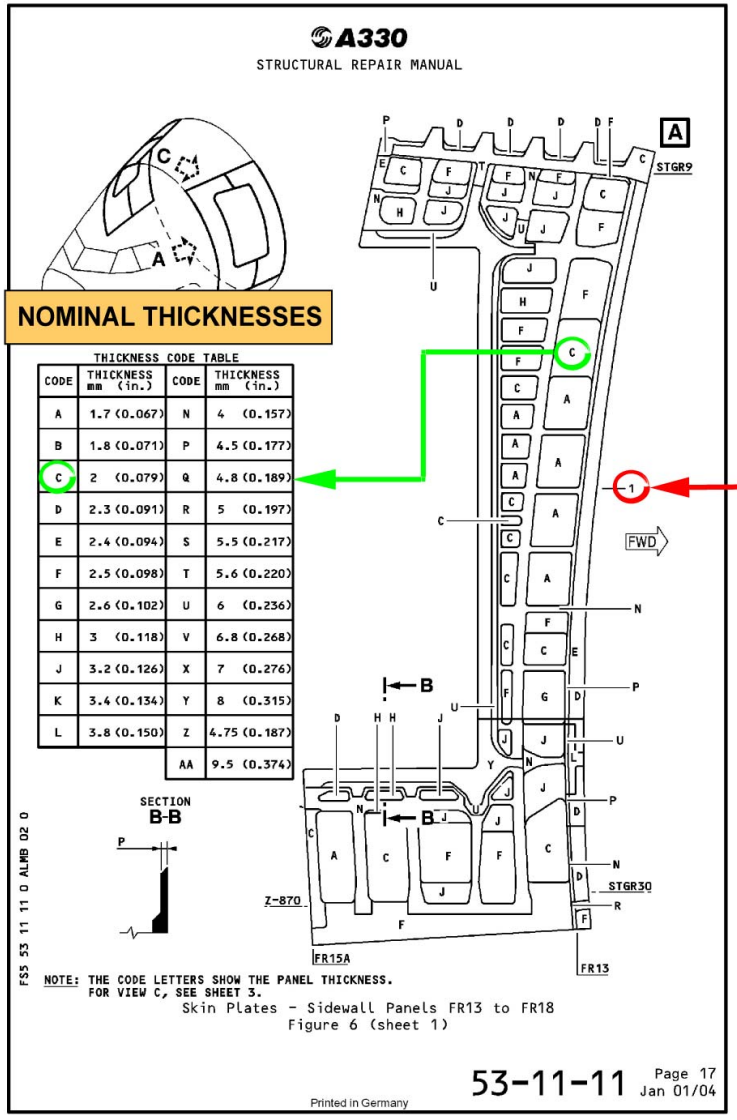
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

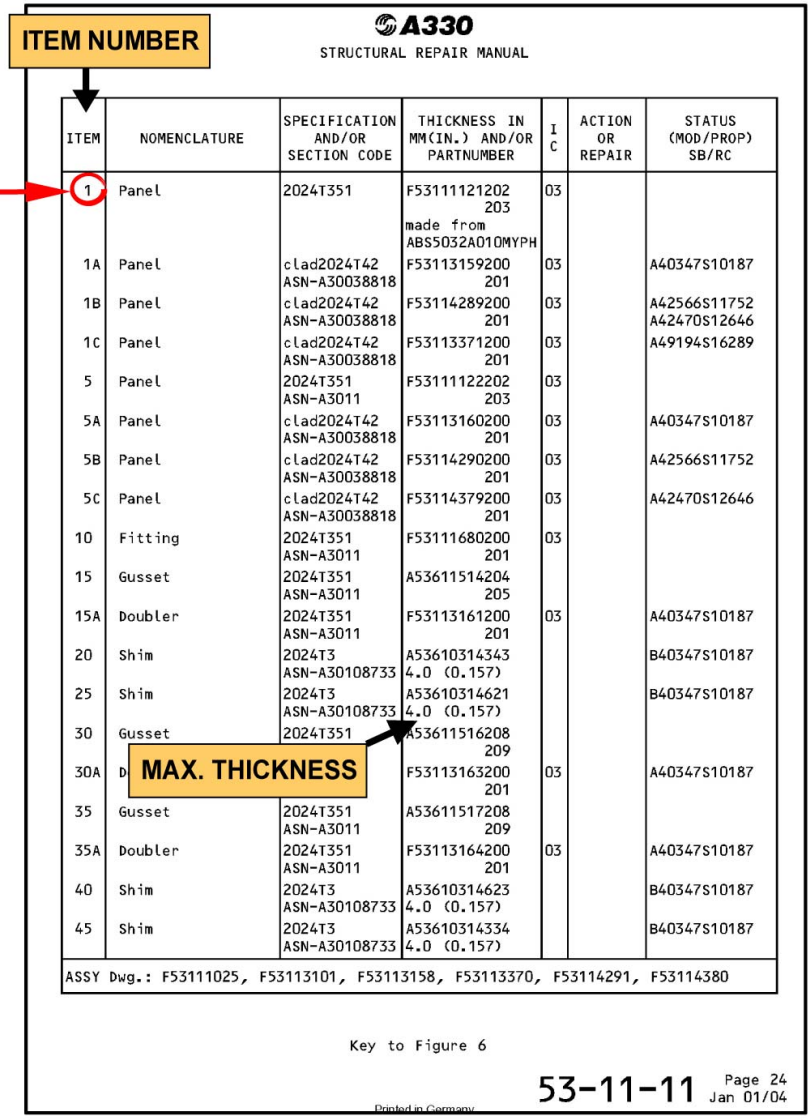
CHAPTER 52 TO 57 CONTENTS (continued)

IDENTIFICATION PAGES - EXAMPLE: METALLIC STRUCTURES

The item number is the key in between the illustration and the identification table. For metallic structure such as fuselage skin panels, the different material thicknesses are provided, using letter codes or shaded areas as a key to the thickness tables. The associated identification table provides the additional material and the Part Number (PN) modification status information.

G4J06491 - G0UT1M0 - FM51DZ000000001


A330
STRUCTURAL REPAIR MANUAL
NOMINAL THICKNESSES
THICKNESS CODE TABLE
CODE | THICKNESS mm (in.) | CODE | THICKNESS mm (in.)
A | 1.7 (0.067) | N | 4 (0.157)
B | 1.8 (0.071) | P | 4.5 (0.177)
C | 2 (0.079) | Q | 4.8 (0.189)
D | 2.3 (0.091) | R | 5 (0.197)
E | 2.4 (0.094) | S | 5.5 (0.217)
F | 2.5 (0.098) | T | 5.6 (0.220)
G | 2.6 (0.102) | U | 6 (0.236)
H | 3 (0.118) | V | 6.8 (0.268)
J | 3.2 (0.126) | X | 7 (0.276)
K | 3.4 (0.134) | Y | 8 (0.315)
L | 3.8 (0.150) | Z | 4.75 (0.187)
AA | 9.5 (0.374)
SECTION B-B
FWD
STGR9
STGR30
Z-870
FR15A
FR13
FS5 53 11 11 0 ALMB 02 0
NOTE: THE CODE LETTERS SHOW THE PANEL THICKNESS.
FOR VIEW C, SEE SHEET 3.
Skin Plates - Sidewall Panels FR13 to FR18
Figure 6 (sheet 1)
53-11-11 Page 17 Jan 01/04
Printed in Germany



CHAPTER 52 TO 57 CONTENTS - IDENTIFICATION PAGES - EXAMPLE: METALLIC STRUCTURES

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

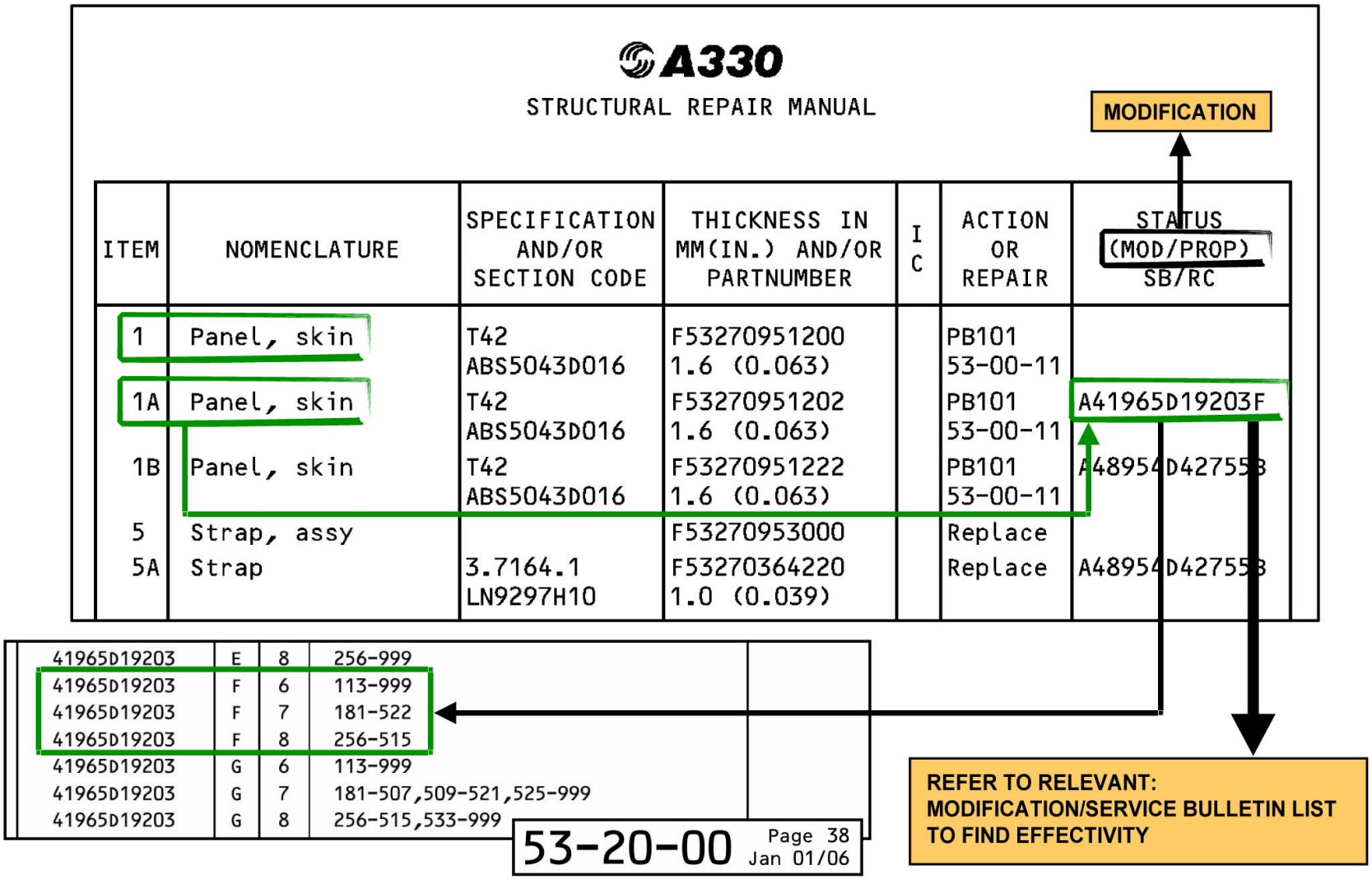
CHAPTER 52 TO 57 CONTENTS (continued)

IDENTIFICATION TABLE DETAILED (STATUS MOD/PROP SB/RC COLUMN)

To find the relevant effectivity linked to a modification shown in the STATUS column, the user must refer to the modification/service bulletin list.

NOTE: Note: the status before or after modification/SB and the relevant modification solution (suffix letter) should not be forgotten. Within the modification/service bulletin list, the effectivity is given in MSN.

G4J06491 - G0UT1M0 - FM51DZ000000001



CHAPTER 52 TO 57 CONTENTS - IDENTIFICATION TABLE DETAILED (STATUS MOD/PROP SB/RC COLUMN)

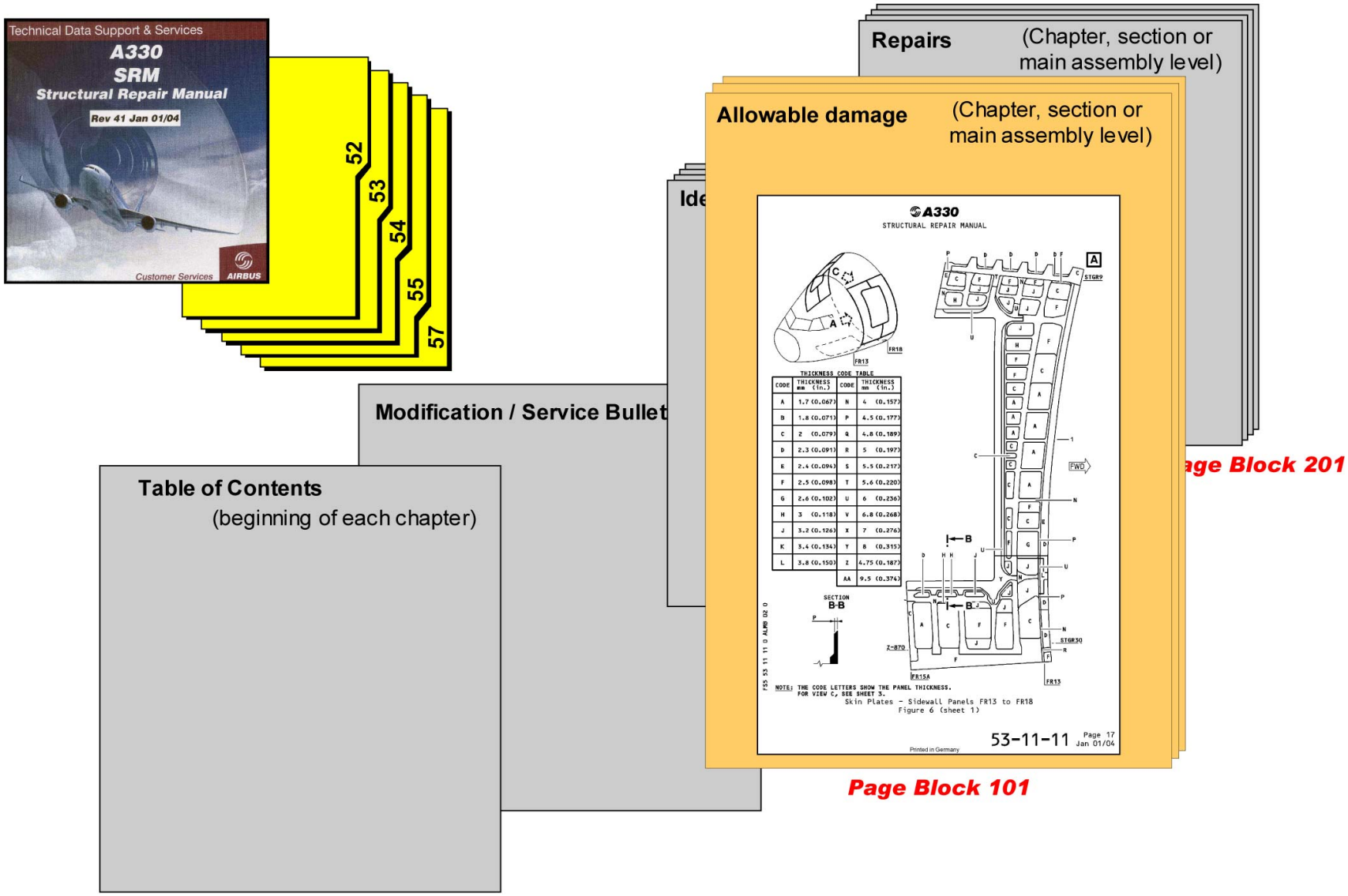
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS (continued)

ALLOWABLE DAMAGE PAGE BLOCK

The information to be found within allowable damage page block enables the operator to define whether a damaged aircraft may be returned into service without repair. An allowable damage permitted has no significant effect on the strength or fatigue life of the structure, which must still be capable of fulfilling its function. Allowable damage may require minimal rework such as cleanup or drilling of stop holes.

G4J06491 - G0UT1M0 - FM51DZ000000001



CHAPTER 52 TO 57 CONTENTS - ALLOWABLE DAMAGE PAGE BLOCK

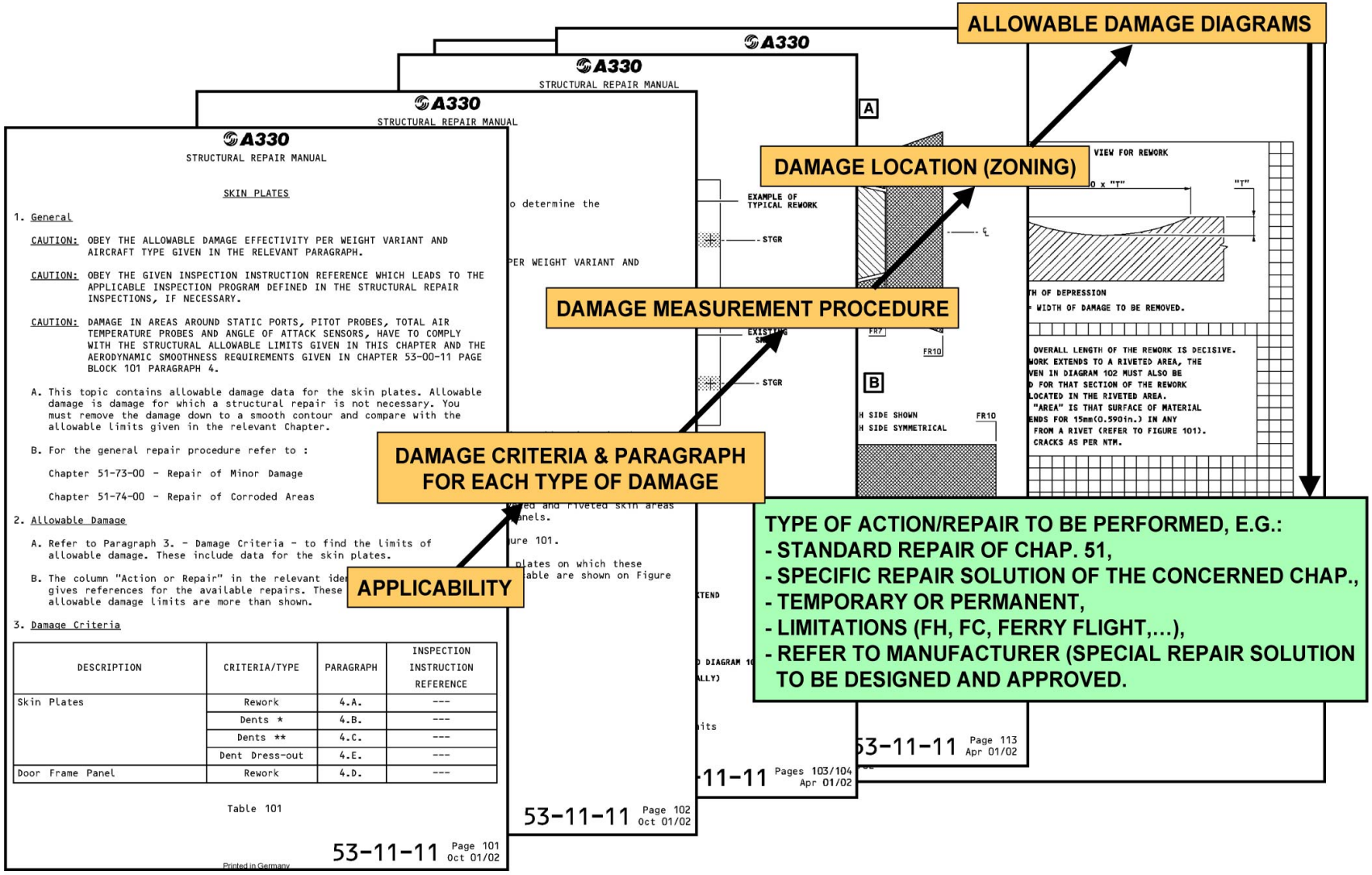
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS (continued)

ALLOWABLE DAMAGE PAGE BLOCK - LAYOUT

Basically, the allowable page block contains different page types:
- general information pages,
- damage criteria tables,
- paragraph for each type of damage,
- damage measurement procedure,
- damage localization (zoning) figures,
- allowable damage diagram.

G4J06491 - G0UT1M0 - FM51DZ000000001


ALLOWABLE DAMAGE DIAGRAMS
DAMAGE LOCATION (ZONING)
DAMAGE MEASUREMENT PROCEDURE
DAMAGE CRITERIA & PARAGRAPH FOR EACH TYPE OF DAMAGE
APPLICABILITY
TYPE OF ACTION/REPAIR TO BE PERFORMED, E.G.:
- STANDARD REPAIR OF CHAP. 51,
- SPECIFIC REPAIR SOLUTION OF THE CONCERNED CHAP.,
- TEMPORARY OR PERMANENT,
- LIMITATIONS (FH, FC, FERRY FLIGHT,...),
- REFER TO MANUFACTURER (SPECIAL REPAIR SOLUTION TO BE DESIGNED AND APPROVED.
A330
STRUCTURAL REPAIR MANUAL
SKIN PLATES
1. General
CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN THE RELEVANT PARAGRAPH.
CAUTION: OBEY THE GIVEN INSPECTION INSTRUCTION REFERENCE WHICH LEADS TO THE APPLICABLE INSPECTION PROGRAM DEFINED IN THE STRUCTURAL REPAIR INSPECTIONS, IF NECESSARY.
CAUTION: DAMAGE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND ANGLE OF ATTACK SENSORS, HAVE TO COMPLY WITH THE STRUCTURAL ALLOWABLE LIMITS GIVEN IN THIS CHAPTER AND THE AERODYNAMIC SMOOTHNESS REQUIREMENTS GIVEN IN CHAPTER 53-00-11 PAGE BLOCK 101 PARAGRAPH 4.
A. This topic contains allowable damage data for the skin plates. Allowable damage is damage for which a structural repair is not necessary. You must remove the damage down to a smooth contour and compare with the allowable limits given in the relevant Chapter.
B. For the general repair procedure refer to :
Chapter 51-73-00 - Repair of Minor Damage
Chapter 51-74-00 - Repair of Corroded Areas
2. Allowable Damage
A. Refer to Paragraph 3. - Damage Criteria - to find the limits of allowable damage. These include data for the skin plates.
B. The column "Action or Repair" in the relevant ide gives references for the available repairs. These allowable damage limits are more than shown.
3. Damage Criteria
DESCRIPTION | CRITERIA/TYPE | PARAGRAPH | INSPECTION INSTRUCTION REFERENCE
Skin Plates | Rework | 4.A. | ---
Dents * | 4.B. | ---
Dents ** | 4.C. | ---
Dent Dress-out | 4.E. | ---
Door Frame Panel | Rework | 4.D. | ---
Table 101
Printed in Germany
53-11-11 Page 101 Oct 01/02
53-11-11 Page 102 Oct 01/02
53-11-11 Pages 103/104 Apr 01/02
53-11-11 Page 113 Apr 01/02
EXAMPLE OF TYPICAL REWORK
STGR
VIEW FOR REWORK
OVERALL LENGTH OF THE REWORK IS DECISIVE.
WORK EXTENDS TO A RIVETED AREA, THE
VEN IN DIAGRAM 102 MUST ALSO BE
FOR THAT SECTION OF THE REWORK
LOCATED IN THE RIVETED AREA.
"AREA" IS THAT SURFACE OF MATERIAL
ENDS FOR 15mm(0.59in.) IN ANY
FROM A RIVET (REFER TO FIGURE 101).
CRACKS AS PER NTM.

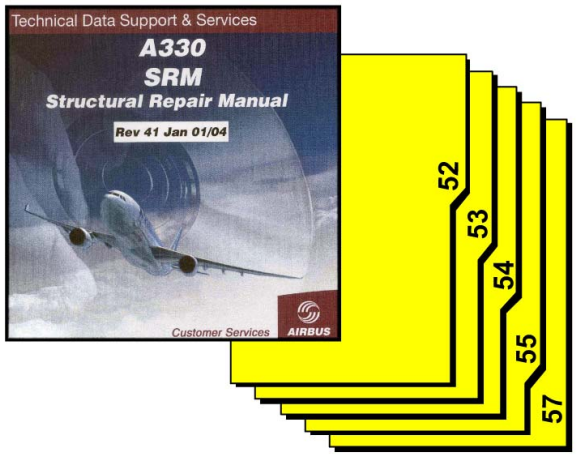
CHAPTER 52 TO 57 CONTENTS - ALLOWABLE DAMAGE PAGE BLOCK - LAYOUT

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS (continued)

REPAIRS PAGE BLOCK

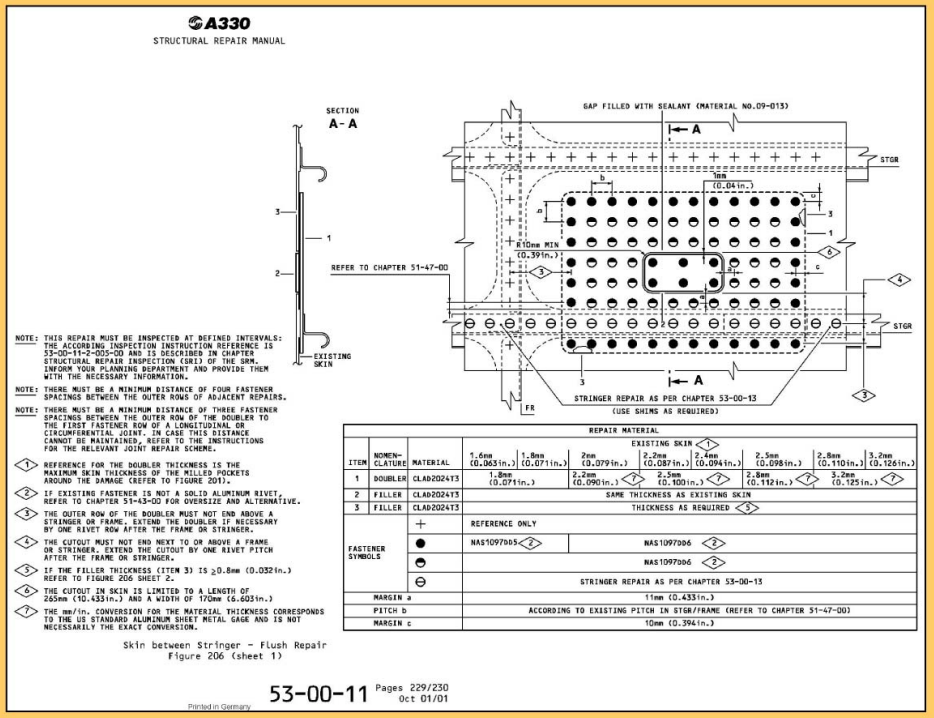
The repairs page block (PB 201), contains necessary information to carry out permissible repairs.



Modification / Ser

Table of Contents
(beginning of each chapter)

Repairs
(Chapter, section or main assembly level)


A330
STRUCTURAL REPAIR MANUAL
SECTION A-A
GAP FILLED WITH SEALANT (MATERIAL NO.09-013)
REFER TO CHAPTER 51-47-00
EXISTING SKIN
STRINGER REPAIR AS PER CHAPTER 53-00-13
(USE SHIMS AS REQUIRED)
NOTE: THIS REPAIR MUST BE INSPECTED AT DEFINED INTERVALS: THE ACCORDING INSPECTION INSTRUCTION REFERENCE IS 53-00-11-2-005-00 AND IS DESCRIBED IN CHAPTER STRUCTURAL REPAIR INSPECTION (SRI) OF THE SRM. INFORM YOUR PLANNING DEPARTMENT AND PROVIDE THEM WITH THE NECESSARY INFORMATION.
NOTE: THERE MUST BE A MINIMUM DISTANCE OF FOUR FASTENER SPACINGS BETWEEN THE OUTER ROWS OF ADJACENT REPAIRS.
NOTE: THERE MUST BE A MINIMUM DISTANCE OF THREE FASTENER SPACINGS BETWEEN THE OUTER ROW OF THE DOUBLER TO THE FIRST FASTENER ROW OF A LONGITUDINAL OR CIRCUMFERENTIAL JOINT. IN CASE THIS DISTANCE CANNOT BE MAINTAINED, REFER TO THE INSTRUCTIONS FOR THE RELEVANT JOINT REPAIR SCHEME.
1 REFERENCE FOR THE DOUBLER THICKNESS IS THE MAXIMUM SKIN THICKNESS OF THE MILLED POCKETS AROUND THE DAMAGE (REFER TO FIGURE 201).
2 IF EXISTING FASTENER IS NOT A SOLID ALUMINUM RIVET, REFER TO CHAPTER 51-43-00 FOR OVERSIZE AND ALTERNATIVE.
3 THE OUTER ROW OF THE DOUBLER MUST NOT END ABOVE A STRINGER OR FRAME. EXTEND THE DOUBLER IF NECESSARY BY ONE RIVET ROW AFTER THE FRAME OR STRINGER.
4 THE CUTOUT MUST NOT END NEXT TO OR ABOVE A FRAME OR STRINGER. EXTEND THE CUTOUT BY ONE RIVET PITCH AFTER THE FRAME OR STRINGER.
5 IF THE FILLER THICKNESS (ITEM 3) IS ≥0.8mm (0.032in.) REFER TO FIGURE 206 SHEET 2.
6 THE CUTOUT IN SKIN IS LIMITED TO A LENGTH OF 265mm (10.433in.) AND A WIDTH OF 170mm (6.693in.)
7 THE mm/in. CONVERSION FOR THE MATERIAL THICKNESS CORRESPONDS TO THE US STANDARD ALUMINUM SHEET METAL GAGE AND IS NOT NECESSARILY THE EXACT CONVERSION.
REPAIR MATERIAL
ITEM NOMENCLATURE MATERIAL
1 DOUBLER CLAD2024T3
2 FILLER CLAD2024T3
3 FILLER CLAD2024T3
FASTENER SYMBOLS
MARGIN a 11mm (0.433in.)
PITCH b ACCORDING TO EXISTING PITCH IN STGR/FRAME (REFER TO CHAPTER 51-47-00)
MARGIN c 10mm (0.394in.)
Skin between Stringer - Flush Repair
Figure 206 (sheet 1)
53-00-11 Pages 229/230 Oct 01/01
Printed in Germany

Page Block 201

CHAPTER 52 TO 57 CONTENTS - REPAIRS PAGE BLOCK

STRUCTURE REPAIR MANUAL (SRM) D/O (3)

CHAPTER 52 TO 57 CONTENTS (continued)

REPAIRS PAGE BLOCK - LAYOUT

Each of the repairs is described with illustrations and procedure instructions, which includes repair applicability data and repair materials lists.

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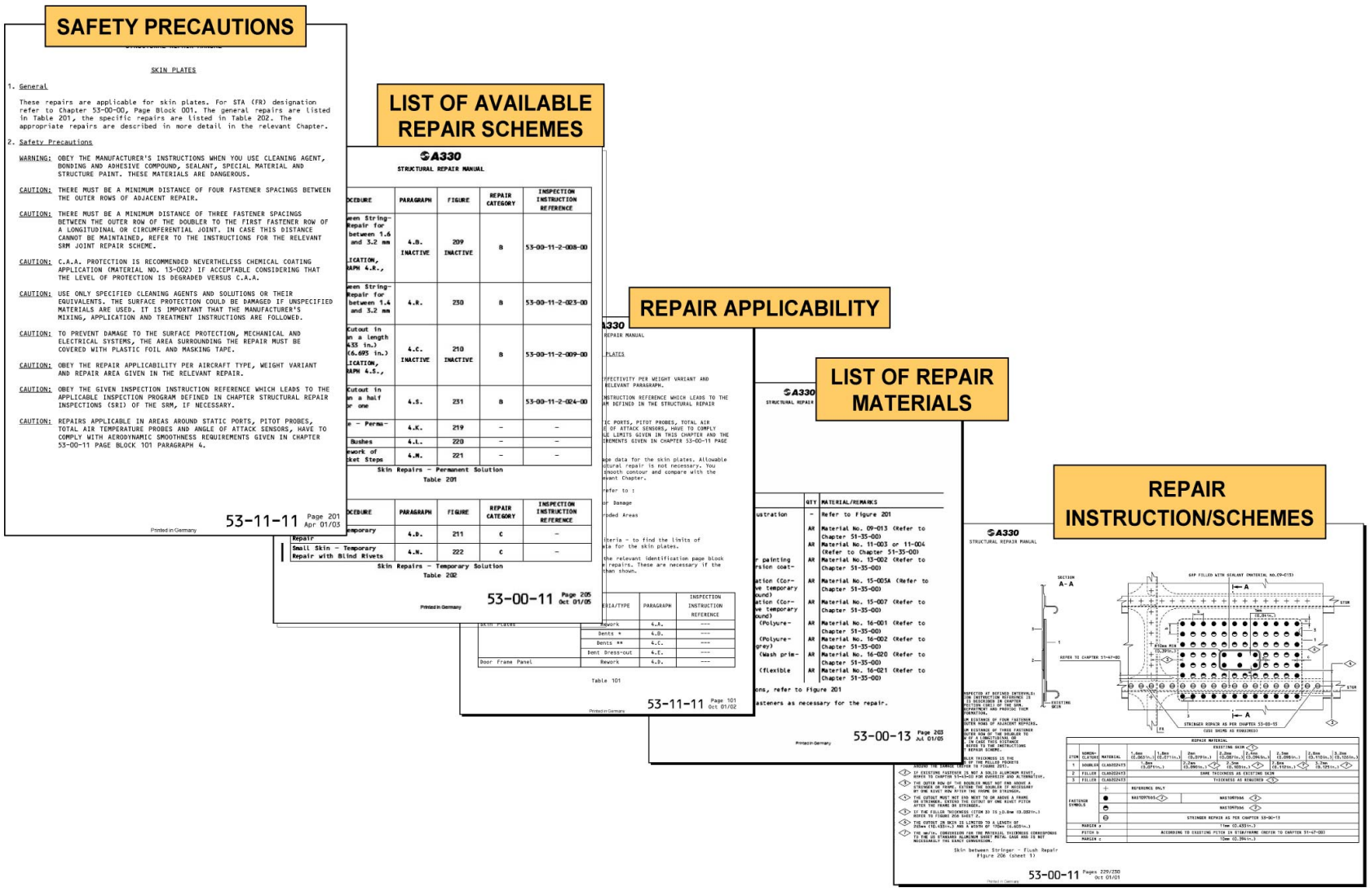

SAFETY PRECAUTIONS
SKIN PLATES
1. General
These repairs are applicable for skin plates. For STA (FR) designation refer to Chapter 53-00-00, Page Block 001. The general repairs are listed in Table 201, the specific repairs are listed in Table 202. The appropriate repairs are described in more detail in the relevant Chapter.
2. Safety Precautions
WARNING: OBEY THE MANUFACTURER'S INSTRUCTIONS WHEN YOU USE CLEANING AGENT, BONDING AND ADHESIVE COMPOUND, SEALANT, SPECIAL MATERIAL AND STRUCTURE PAINT. THESE MATERIALS ARE DANGEROUS.
CAUTION: THERE MUST BE A MINIMUM DISTANCE OF FOUR FASTENER SPACINGS BETWEEN THE OUTER ROWS OF ADJACENT REPAIR.
CAUTION: THERE MUST BE A MINIMUM DISTANCE OF THREE FASTENER SPACINGS BETWEEN THE OUTER ROW OF THE DOUBLER TO THE FIRST FASTENER ROW OF A LONGITUDINAL OR CIRCUMFERENTIAL JOINT. IN CASE THIS DISTANCE CANNOT BE MAINTAINED, REFER TO THE INSTRUCTIONS FOR THE RELEVANT SRM JOINT REPAIR SCHEME.
CAUTION: C.A.A. PROTECTION IS RECOMMENDED NEVERTHELESS CHEMICAL COATING APPLICATION (MATERIAL NO. 13-002) IF ACCEPTABLE CONSIDERING THAT THE LEVEL OF PROTECTION IS DEGRADED VERSUS C.A.A.
CAUTION: USE ONLY SPECIFIED CLEANING AGENTS AND SOLUTIONS OR THEIR EQUIVALENTS. THE SURFACE PROTECTION COULD BE DAMAGED IF UNSPECIFIED MATERIALS ARE USED. IT IS IMPORTANT THAT THE MANUFACTURER'S MIXING, APPLICATION AND TREATMENT INSTRUCTIONS ARE FOLLOWED.
CAUTION: TO PREVENT DAMAGE TO THE SURFACE PROTECTION, MECHANICAL AND ELECTRICAL SYSTEMS, THE AREA SURROUNDING THE REPAIR MUST BE COVERED WITH PLASTIC FOIL AND MASKING TAPE.
CAUTION: OBEY THE REPAIR APPLICABILITY PER AIRCRAFT TYPE, WEIGHT VARIANT AND REPAIR AREA GIVEN IN THE RELEVANT REPAIR.
CAUTION: OBEY THE GIVEN INSPECTION INSTRUCTION REFERENCE WHICH LEADS TO THE APPLICABLE INSPECTION PROGRAM DEFINED IN CHAPTER STRUCTURAL REPAIR INSPECTIONS (SRI) OF THE SRM, IF NECESSARY.
CAUTION: REPAIRS APPLICABLE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND ANGLE OF ATTACK SENSORS, HAVE TO COMPLY WITH AERODYNAMIC SMOOTHNESS REQUIREMENTS GIVEN IN CHAPTER 53-00-11 PAGE BLOCK 101 PARAGRAPH 4.
53-11-11 Page 201 Apr 01/03
LIST OF AVAILABLE REPAIR SCHEMES
A330
STRUCTURAL REPAIR MANUAL
Skin Repairs – Permanent Solution
Table 201
Skin Repairs – Temporary Solution
Table 202
53-00-11 Page 205 Oct 01/05
REPAIR APPLICABILITY
Table 101
53-11-11 Page 101 Oct 01/02
LIST OF REPAIR MATERIALS
53-00-13 Page 203 Jul 01/05
REPAIR INSTRUCTION/SCHEMES
53-00-11 Pages 229/230 Oct 01/01

CHAPTER 52 TO 57 CONTENTS - REPAIRS PAGE BLOCK - LAYOUT

G4J06491 - G0UT1M0 - FM51DZ000000001

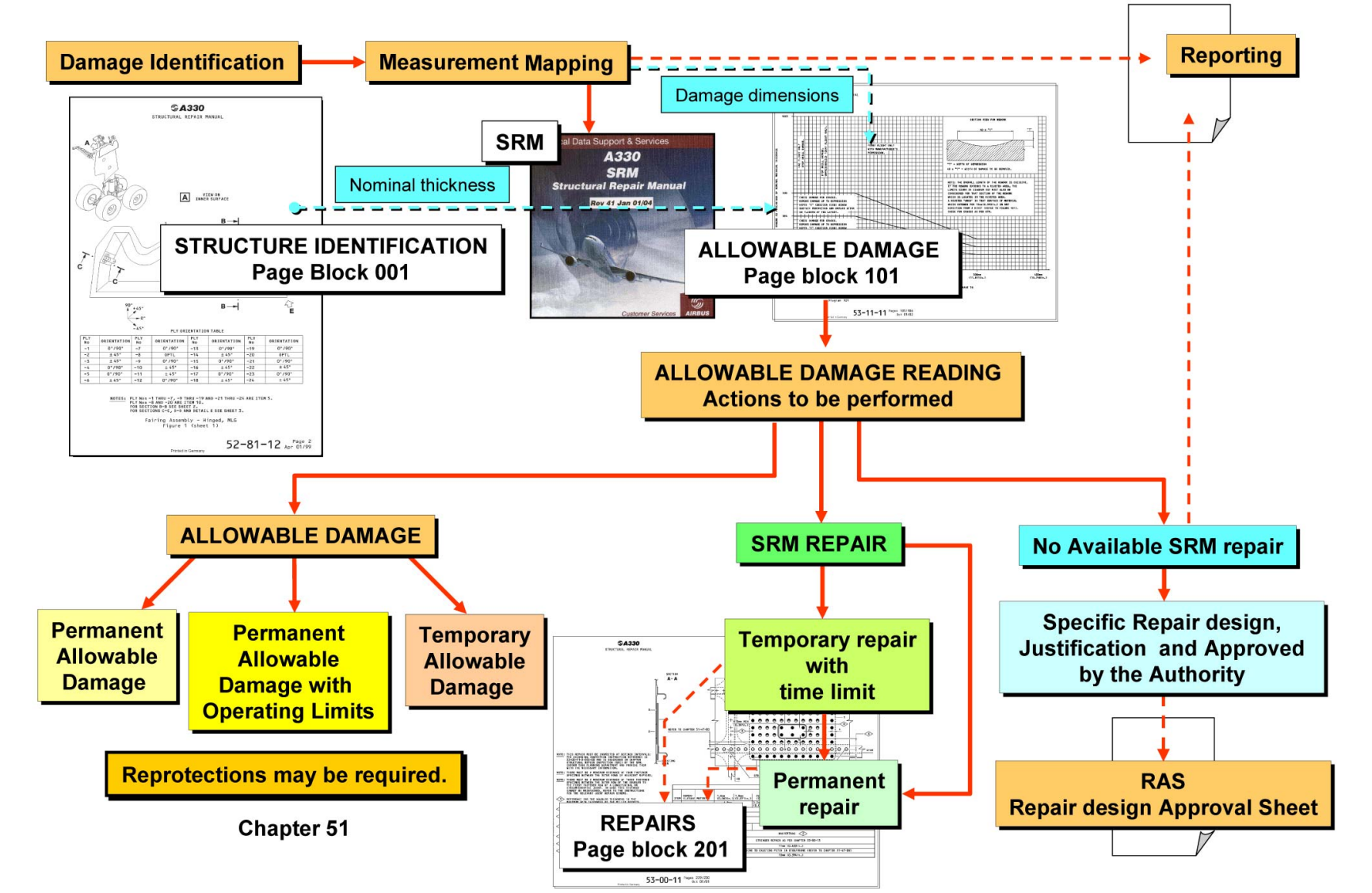
STRUCTURE REPAIR MANUAL (SRM) D/O (3)

SRM GENERAL USAGE PROCEDURE

When a damage is discovered, the first step is to evaluate, classify and accurately measure by using SRM chapter 51-11-XX.
The next step is the full identification of the affected area/structure. This is achieved using the identification page block (pages 01-99) of the related specific chapter/section (52-57). According to the original structure data and the actual damage characteristics, it is then possible to determine whether the damage is within the defined allowable limits or not. This is done using the allowable damage page block (pages 101-199) of the related specific chapter/section. If the damage is within the allowable limits, the damage can be:
- permanent,
- permanent with operating limits,
- temporary.

If the damage is above the limits, you must check whether a repair is available and/or applicable within the repair page block (pages 201-999). If not, a specific repair design will be performed and will have to be approved by the authority. A Repair Design Approval Sheet (RAS) will be created by Airbus and sent to the operator.
The RAS:
- is the Airbus form for approval issuance,
- identifies the repaired parts,
- links all the relevant material.

G4J06491 - G0UT1M0 - FM51DZ000000001

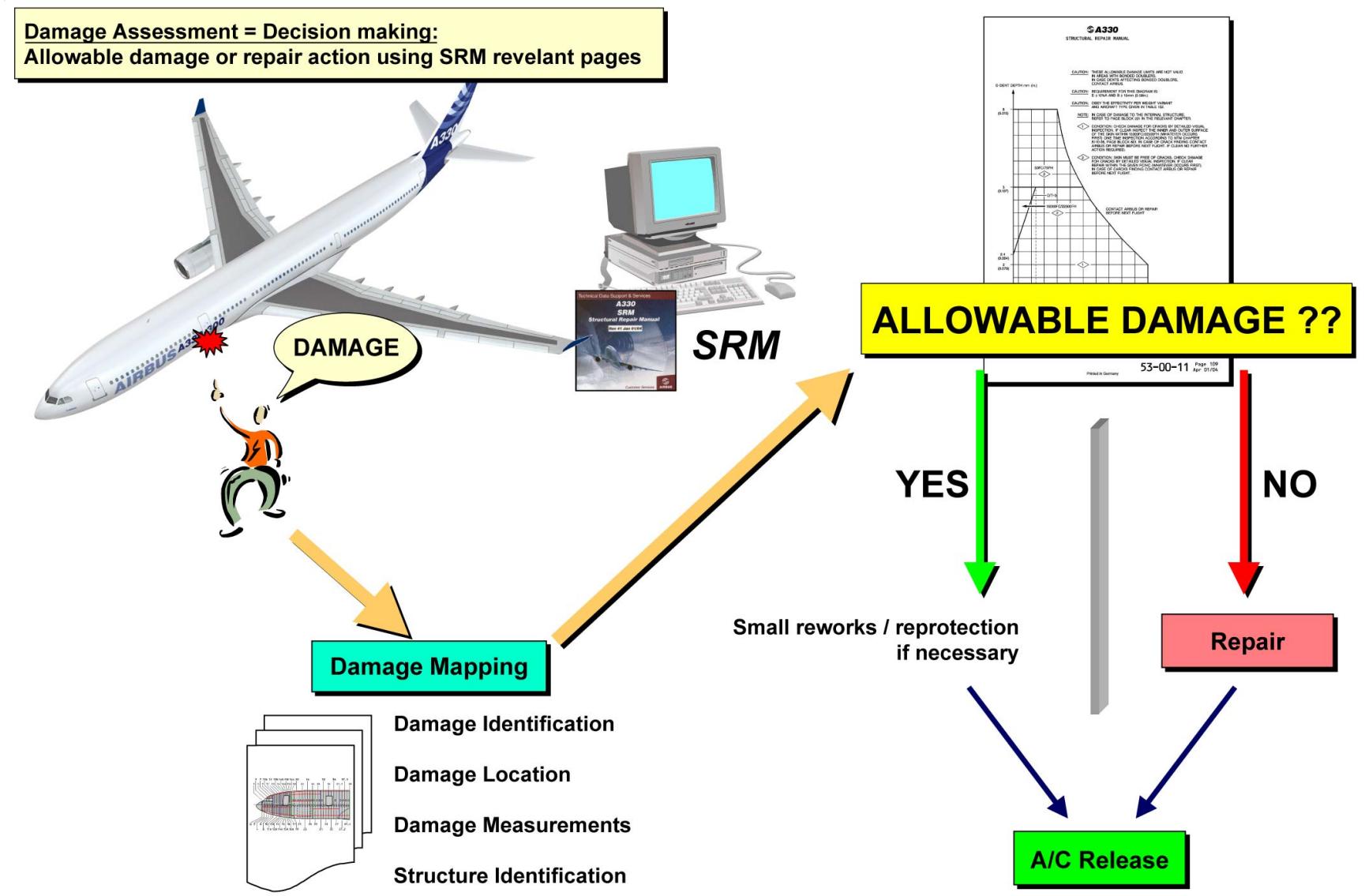


SRM GENERAL USAGE PROCEDURE

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

INTRODUCTION

The purpose of this example is to present you, the complete procedure to be followed when a damage is discovered, from the damage mapping up to the final decision making using SRM relevant information. This investigation enables the operator to know whether the damage is allowable or if a repair has to be performed before the release of the A/C. This example was chosen as it represents a common type of damage encountered in service.

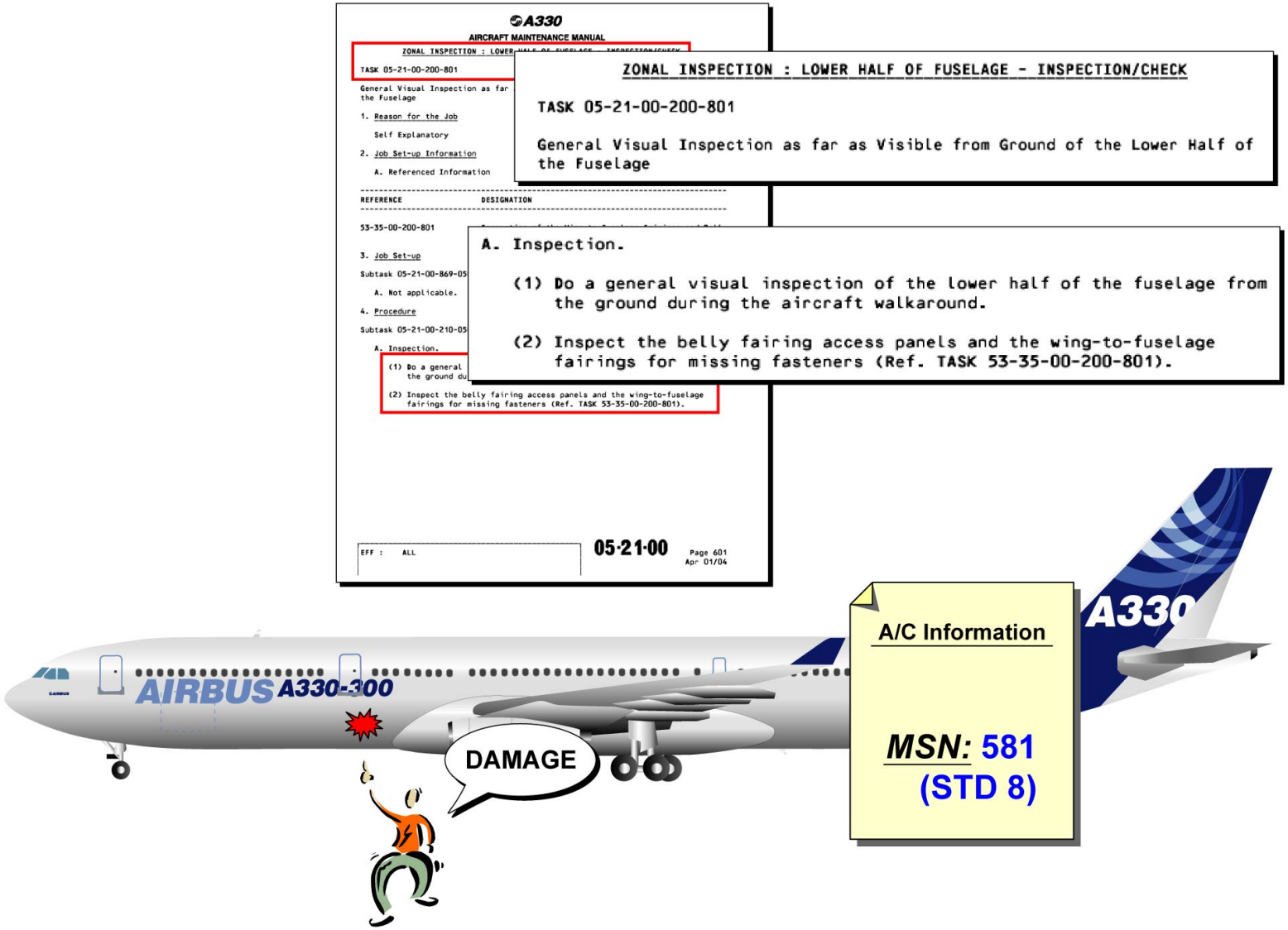


INTRODUCTION

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DAMAGE PRESENTATION

During a routine inspection of the lower half of the fuselage, damage has been detected onto the fuselage skin.
In such situation the AMM refers to the Structural Repair Manual to determine whether the damage is allowable or not and what are the subsequent actions to be performed.
First information: the concerned aircraft is MSN 581 (standard 8)


A330
AIRCRAFT MAINTENANCE MANUAL
ZONAL INSPECTION : LOWER HALF OF FUSELAGE - INSPECTION/CHECK
TASK 05-21-00-200-801
General Visual Inspection as far as Visible from Ground of the Lower Half of the Fuselage
1. Reason for the Job
Self Explanatory
2. Job Set-up Information
A. Referenced Information
REFERENCE
DESIGNATION
53-35-00-200-801
3. Job Set-up
Subtask 05-21-00-869-05
A. Not applicable.
4. Procedure
Subtask 05-21-00-210-05
A. Inspection.
(1) Do a general visual inspection of the lower half of the fuselage from the ground during the aircraft walkaround.
(2) Inspect the belly fairing access panels and the wing-to-fuselage fairings for missing fasteners (Ref. TASK 53-35-00-200-801).
A. Inspection.
(1) Do a general visual inspection of the lower half of the fuselage from the ground during the aircraft walkaround.
(2) Inspect the belly fairing access panels and the wing-to-fuselage fairings for missing fasteners (Ref. TASK 53-35-00-200-801).
EFF : ALL
05-21-00
Page 601
Apr 01/04
AIRBUS A330-300
A330
DAMAGE
A/C Information
MSN: 581
(STD 8)

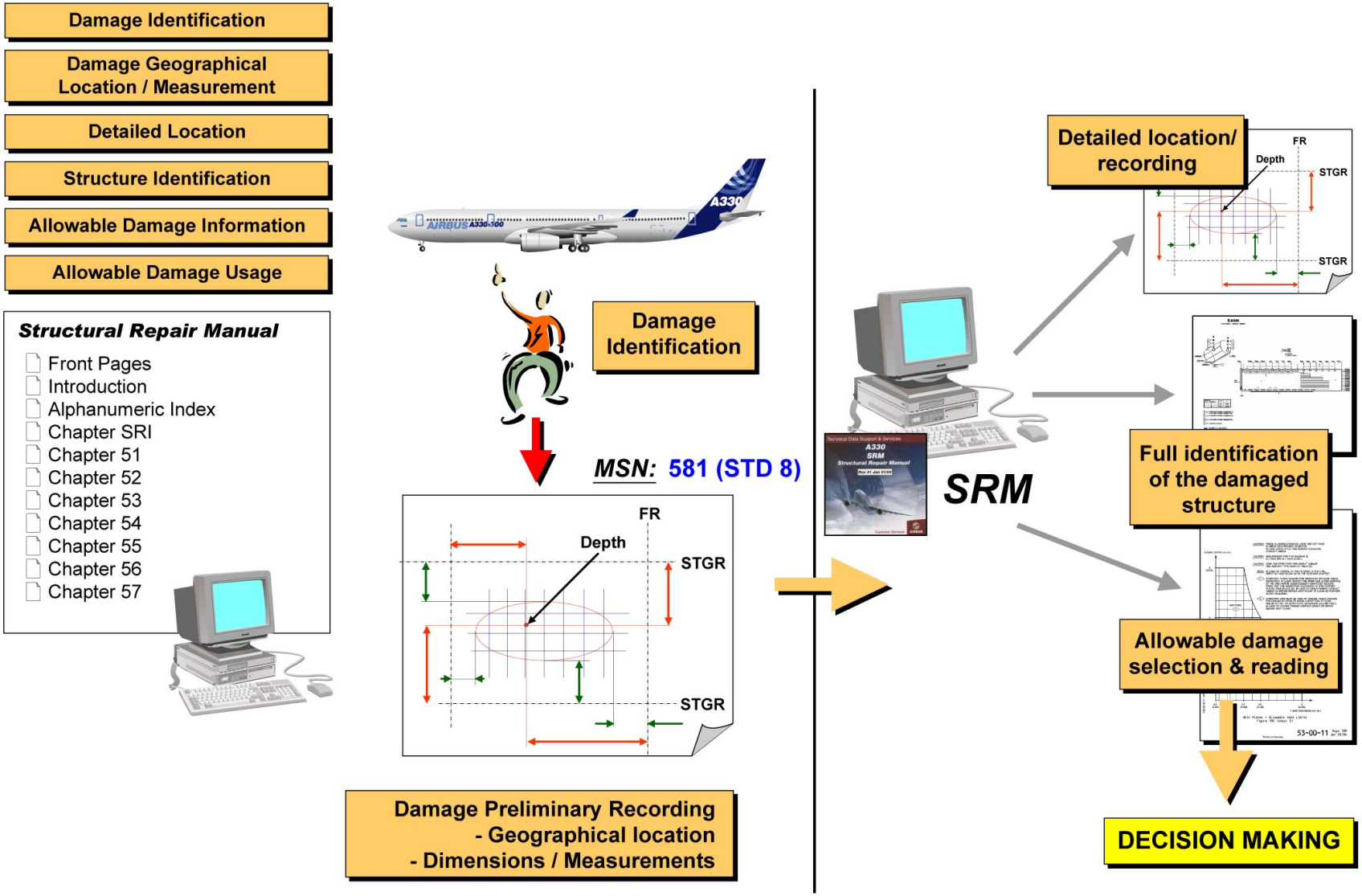
DAMAGE PRESENTATION

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ASSESSMENT STEPS

Using SRM as a guide, the damage assessment process consists in different steps:
On the Aircraft:
- damage identification,
- damage preliminary recording/mapping,

Using the SRM:
- detailed location of the damage,
- full identification of the damaged structure (SRM page block 001 - identification pages),
- allowable damage selection and reading (SRM page block 101 - allowable damage),
- decision making with the result of the assessment.



ASSESSMENT STEPS

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

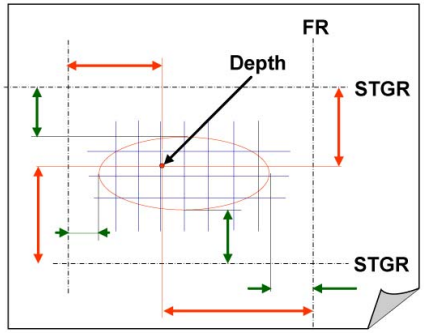
DAMAGE IDENTIFICATION

The first step is to identify the type of damage.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

Damage Identification

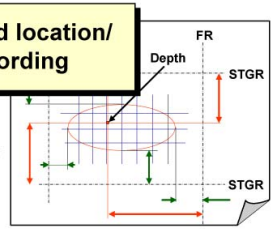
MSN: 581 (STD 8)

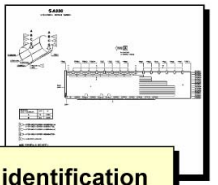


Damage Preliminary Recording
- Geographical location
- Dimensions / Measurements

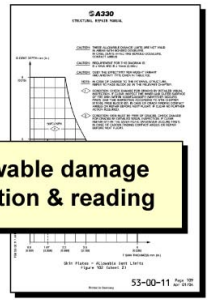
SRM

Detailed location/ recording





Full identification of the damaged structure



Allowable damage selection & reading

DAMAGE IDENTIFICATION

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DAMAGE IDENTIFICATION (continued)

CONT'D

The definition of the different types of damage are described in SRM 51-11-00 chapter dealing with damage classification. A table gives, for each type of damage, the terminology, the possible causes and the description.
EXAMPLE DATA: The concerned damage is a dent with no visible crack.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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Information related to damage types and definitions is given in Chapter 51-11-00

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STRUCTURAL REPAIR MANUAL

TERM	GROUP				DEFINITION
	A	B	C	D	
Scratch	X				A scratch is a line of damage of any depth and length in the material which causes a cross-sectional area change. A sharp object usually causes it.
Gouge	X				A gouge is a damage area of any size which results in a cross-sectional area change. It is usually caused by contact with a relatively sharp object which produces a continuous, sharp or smooth channel-like groove in the material.
Mark	X				A mark is a damaged area of all sizes where a concentration of scratches, nicks, chips, burrs or gouges etc. is shown. You must prepare the damage as an area and not as a series of individual scratches, gouges etc.
Crack	X				A crack is a partial fracture or complete break in the material.
Dent	X				A dent is a damaged area which is pushed in, with respect to its usual contour. There is no cross-sectional area change in the material, area edges are smooth.

Definition of Damage

Table 1

Printed in Germany

51-11-00 Page 3 Oct 01/95

DAMAGE IDENTIFICATION - CONT'D

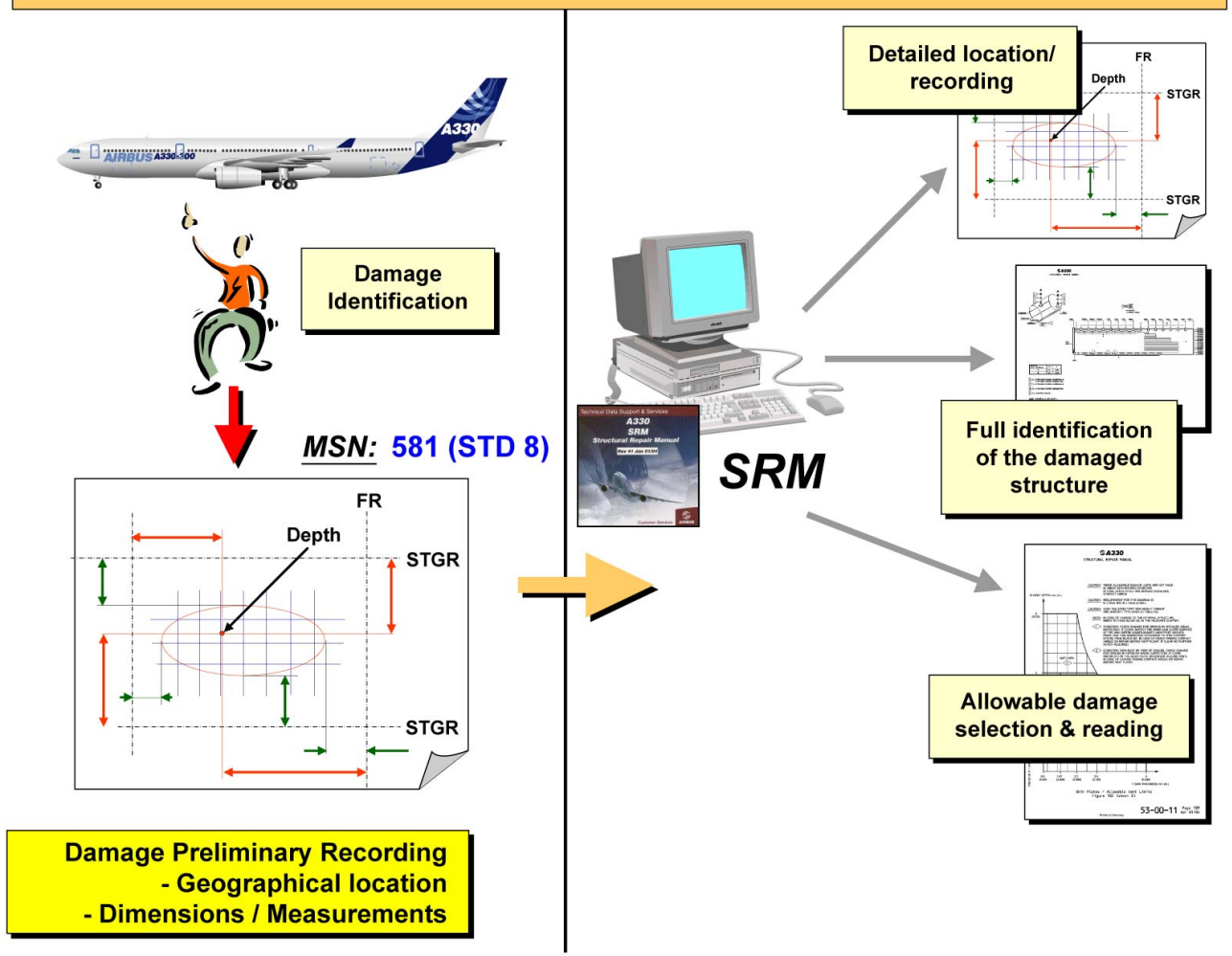
DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT

The Objective of the second step is to establish a preliminary mapping of the damage before any further action using the SRM.

- Damage Identification
- **Damage Geographical Location / Measurement**
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

Objective:
Record the necessary information from the A/C before starting the SRM Investigation.



DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT

G4J06491 - G0UT1M0 - FM51DG000000001
MAINTENANCE COURSE - T1 (LVL 2&3) (GE/US)
51 - STRUCTURE
DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)
Dec 04, 2006
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DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

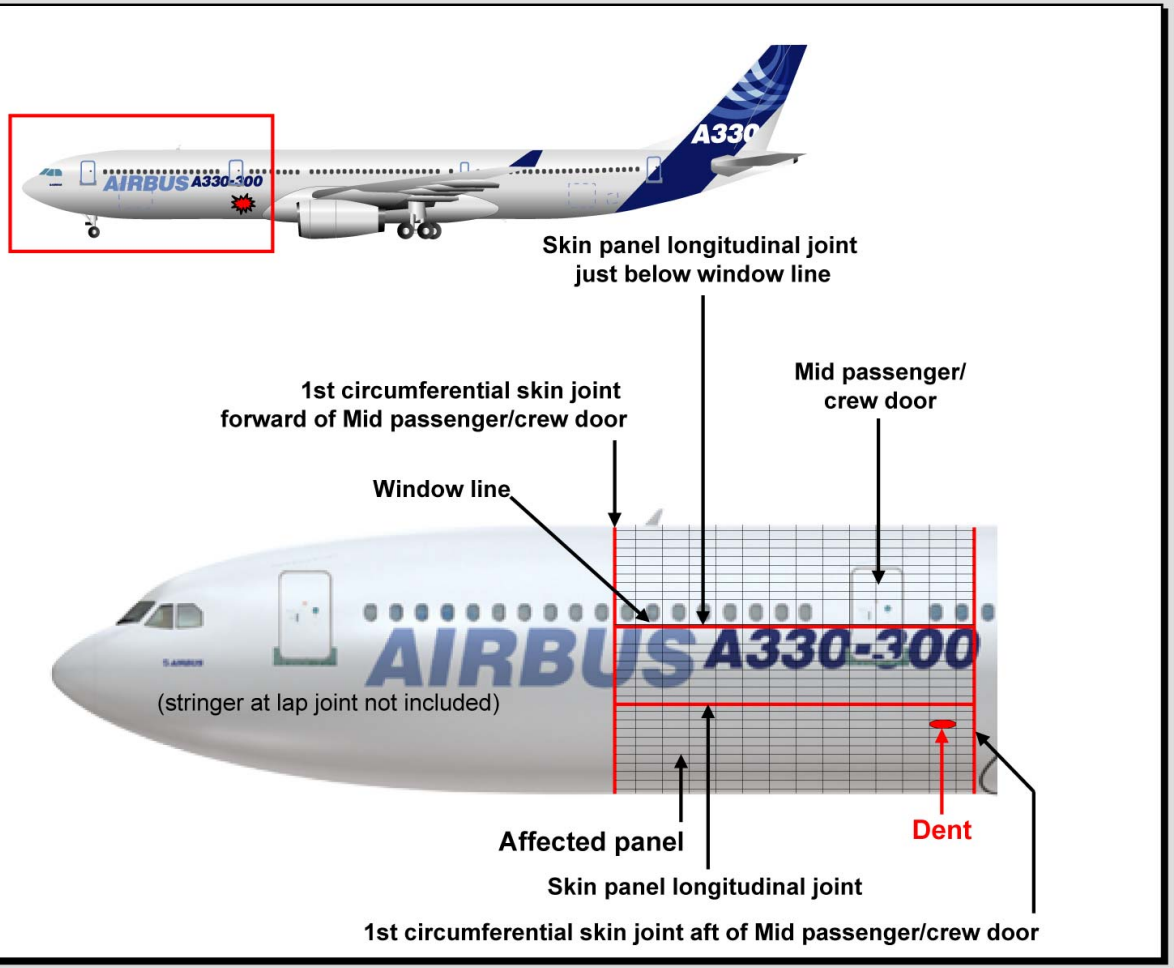
DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT (continued)

CONT'D

Identify all the visible structure details around the damage area (e.g. longitudinal skin joints, circumferential skin joints, fastener lines, window line, etc...). This is the starting point of any damage location.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

On the A/C:
Identify all the visible structure details around the damage area (e.g. longitudinal skin joints, circumferential skin joints, fastener lines, window line, ...)


A330
AIRBUS A330-300
Skin panel longitudinal joint just below window line
1st circumferential skin joint forward of Mid passenger/crew door
Mid passenger/ crew door
Window line
AIRBUS A330-300
(stringer at lap joint not included)
Affected panel
Dent
Skin panel longitudinal joint
1st circumferential skin joint aft of Mid passenger/crew door

DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT - CONT'D

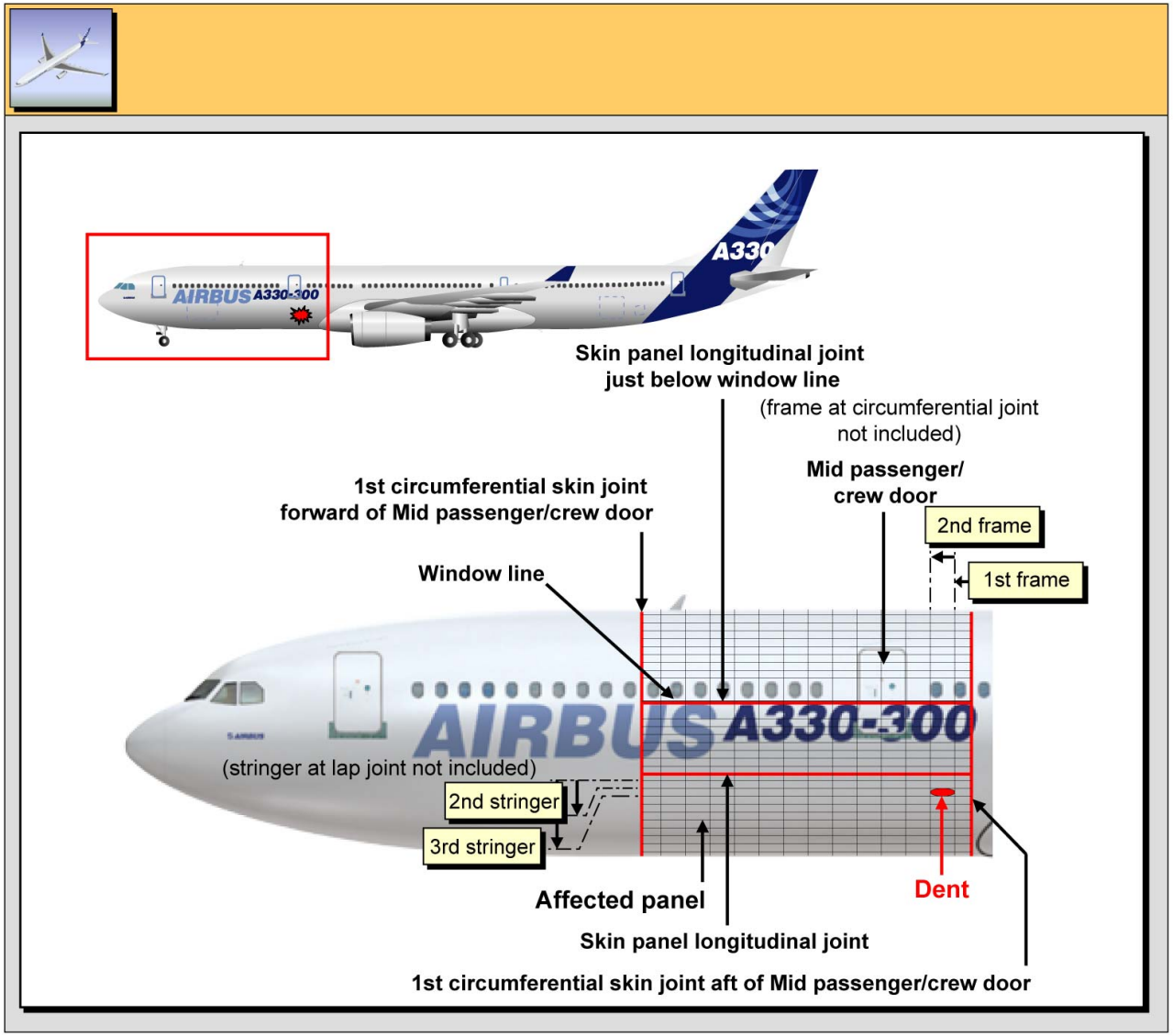
DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT (continued)

CONT'D

The longitudinal and circumferential skin joints around the damage have been located. The location of the damage in relation to these joints shall be determined using the fastener lines (frame and stringer fasteners lines). This information will be used later to clearly identify the frame numbers and stringer numbers surrounding the affected area.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage



DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

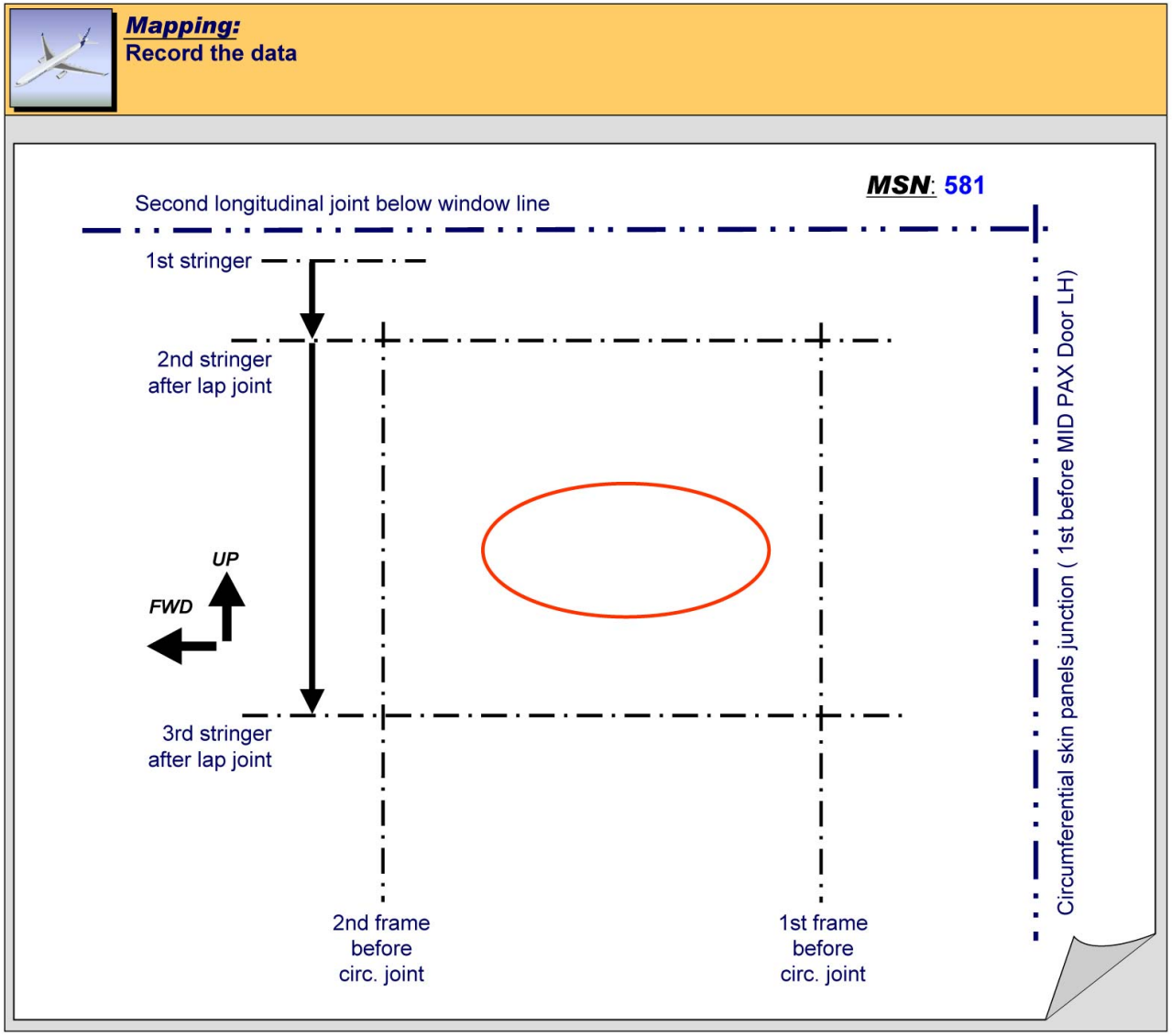
DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT (continued)

CONT'D

The information collected can be reported onto the damage mapping sheet.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- **Damage Geographical Location / Measurement**
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage



DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT (continued)

CONT'D

According to the type of damage, some dimensions and measurements have to be done and recorded. SRM chapter 51-11-13 can be used as a guide to collect the correct information from the aircraft.

- Damage Identification
- **Damage Geographical Location / Measurement**
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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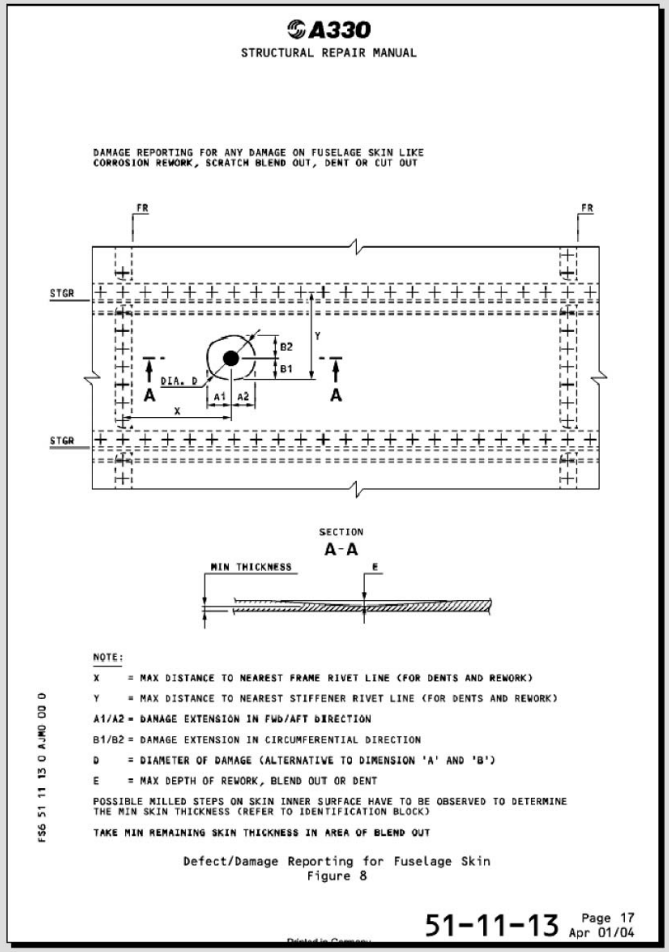
On the A/C:

According to the type of damage, some dimensions and measurements have to be done and recorded.

Refer to SRM chapter 51-11-13 for guidance

DAMAGE/DEFECT REPORTING

51-11-13 Page 1 Oct 01/02



A330
STRUCTURAL REPAIR MANUAL

DAMAGE REPORTING FOR ANY DAMAGE ON FUSELAGE SKIN LIKE CORROSION REWORK, SCRATCH BLEND OUT, DENT OR CUT OUT

FR FR STGR STGR B2 B1 Y DIA. D A A A1 A2 X

SECTION A-A
MIN THICKNESS E

NOTE:
X = MAX DISTANCE TO NEAREST FRAME RIVET LINE (FOR DENTS AND REWORK)
Y = MAX DISTANCE TO NEAREST STIFFENER RIVET LINE (FOR DENTS AND REWORK)
A1/A2 = DAMAGE EXTENSION IN FWD/AFT DIRECTION
B1/B2 = DAMAGE EXTENSION IN CIRCUMFERENTIAL DIRECTION
D = DIAMETER OF DAMAGE (ALTERNATIVE TO DIMENSION 'A' AND 'B')
E = MAX DEPTH OF REWORK, BLEND OUT OR DENT
POSSIBLE MILLED STEPS ON SKIN INNER SURFACE HAVE TO BE OBSERVED TO DETERMINE THE MIN SKIN THICKNESS (REFER TO IDENTIFICATION BLOCK)
TAKE MIN REMAINING SKIN THICKNESS IN AREA OF BLEND OUT

FS6 51 11 13 0 AMD 00 0

Defect/Damage Reporting for Fuselage Skin
Figure 8

51-11-13 Page 17 Apr 01/04

DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

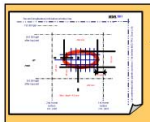
DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT (continued)

CONT'D

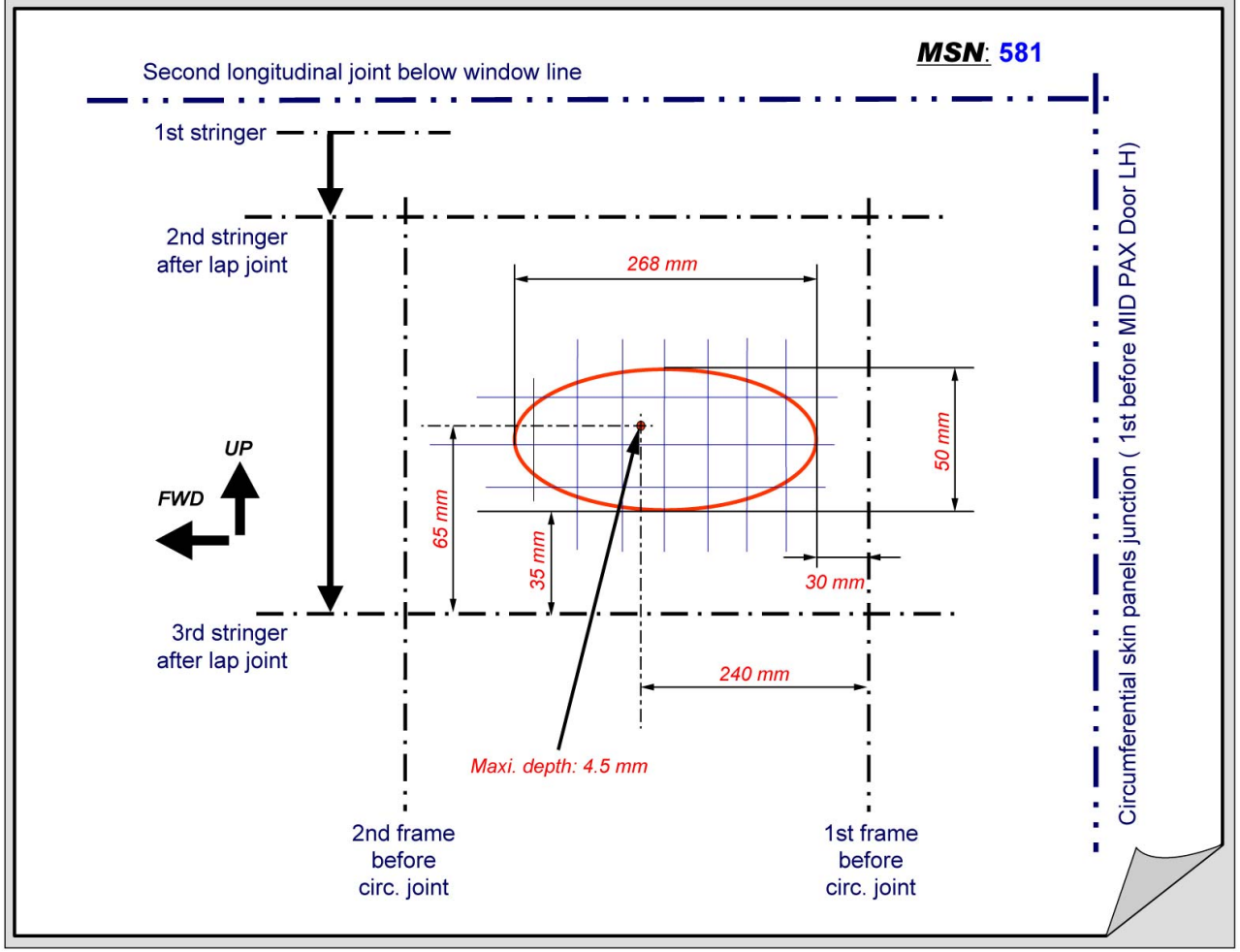
The dent dimensions and distances from the closest skin joints are reported onto the damage mapping.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage



Mapping:
The damage dimensions are recorded.



DAMAGE GEOGRAPHICAL LOCATION/MEASUREMENT - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

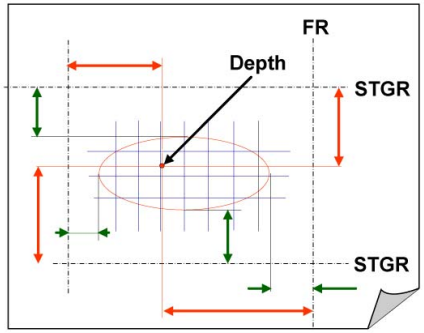
DETAILED LOCATION

Using the data collected from the A/C, the mapping should be completed by determining the exact location (in terms of frame and stringer numbers). This have to be done using the SRM.

- Damage Identification
- Damage Geographical Location / Measurement
- **Detailed Location**
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

Objective:
Using the damage data collected from the A/C (geographical location, dimensions,...).
Use the SRM to refine the damage location (Frame numbers, stringer numbers,...).

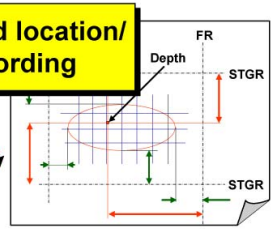
***MSN:* 581 (STD 8)**

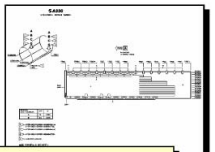


Damage Preliminary Recording
- Geographical location
- Dimensions / Measurements

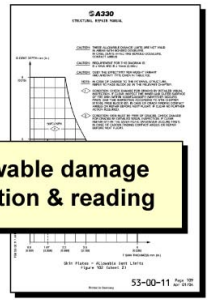
SRM

Detailed location/ recording





Full identification of the damaged structure



Allowable damage selection & reading

DETAILED LOCATION

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

CONT'D

The general section of SRM chapter 53 (53-00-00) provides some illustrations which have to be used to start the identification of the affected area:
- The fuselage sections, with the related border frames,
- The identification of the fuselage skin panels,
- The general frame numbering.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- **Detailed Location**
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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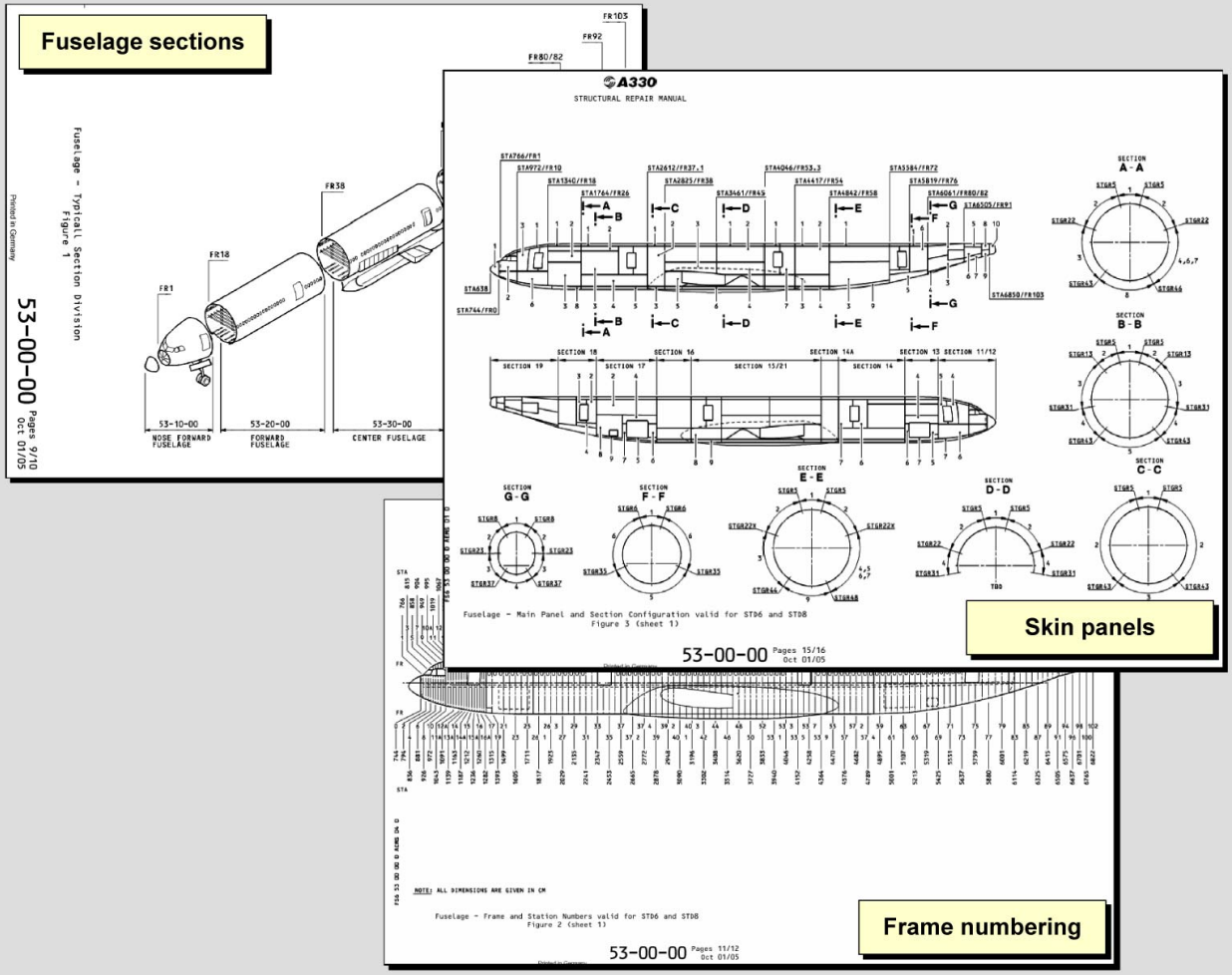
Structural Repair Manual:
The SRM chapter 53-00-00 provides several illustrations to be used to locate the damage.



DETAILED LOCATION - CONT'D

G4J06491 - G0UT1M0 - FM51DG000000001

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

CONT'D

This illustration of chapter 53-00-00 enables the operator to determine concerned fuselage section and its relevant SRM chapter: 53-20-00.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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    - 53-00-11 – 201
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    - 53-00-...
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  - 53-3...
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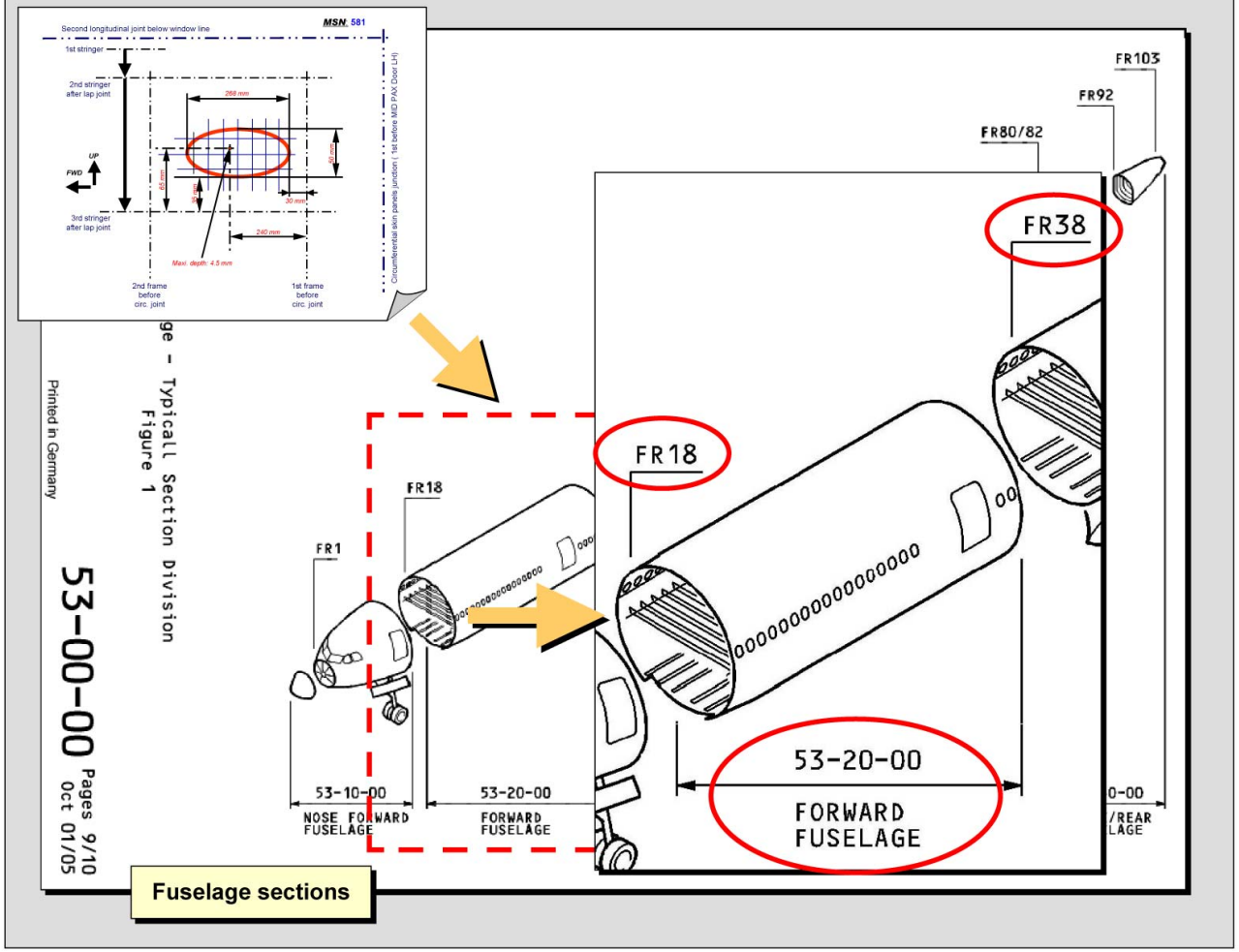
Structural Repair Manual:
Fuselage sections breakdown => Section SRM relevant chapter (53-20-00).



DETAILED LOCATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

CONT'D

Using the frame identification of chapter 53-00-00 and the data collected during the damage mapping, the frames surrounding the damage can be determined. According to the mapping information, the damage is located between the first and the second frame before the circumferential joint located at Frame (FR) 37.1. Consequently, the damage is located between FR 36 and 37.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- **Detailed Location**
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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    - 53-00-11 – 201
    - 53-00-11 – 101
    - 53-00-11 – 201
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  - 53-2...
  - 53-3...
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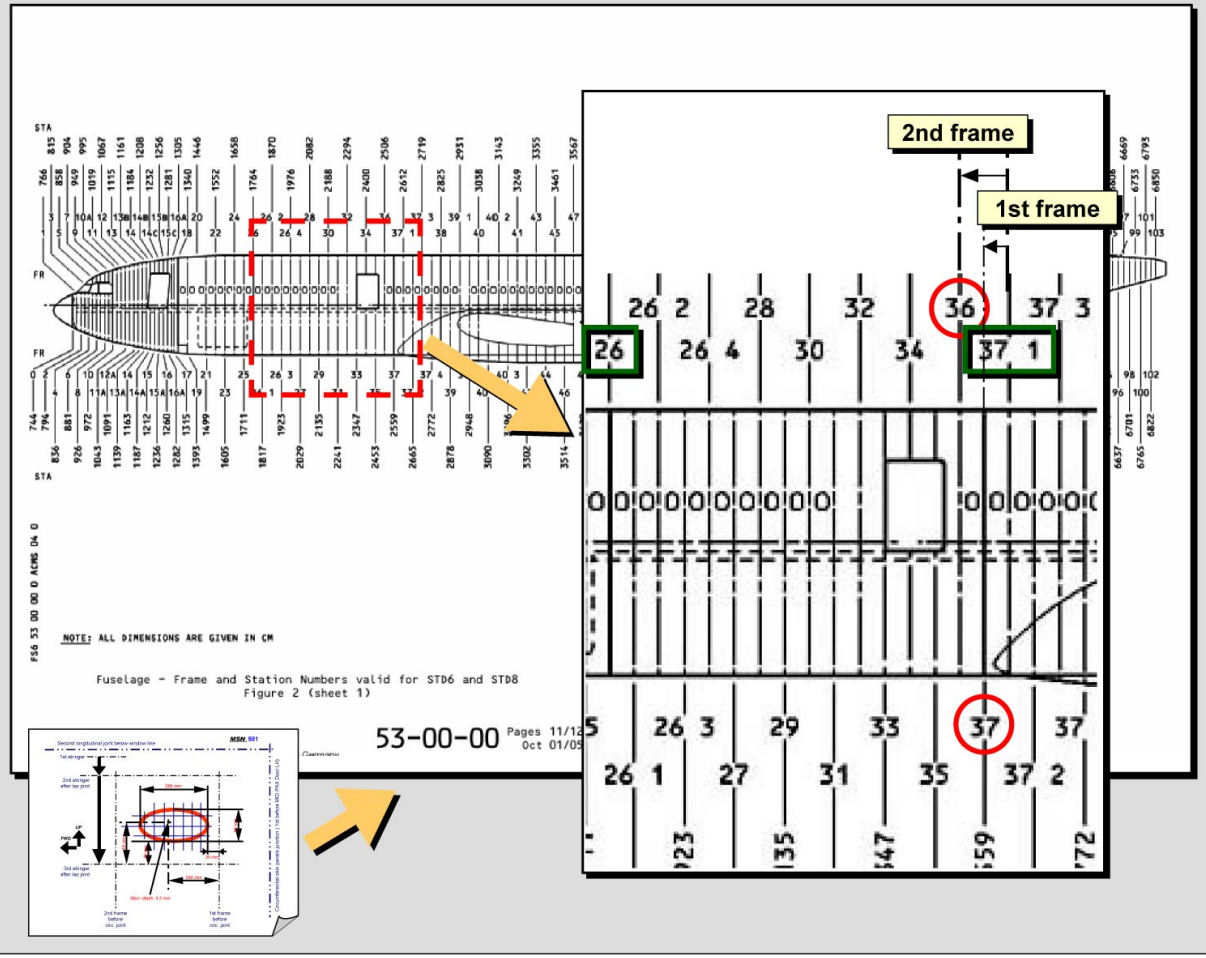
Structural Repair Manual:
Mapping data + Frame breakdown => circumferential joints (FR 26 and 37.1)
=> frames around damage (FR 36 and 37)



DETAILED LOCATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

CONT'D

To complete the damage location, the stringers surrounding the damage need also to be determined. For this purpose, the "General panel identification" illustrations given in chapter 53-00-00 can be used. According to the data collected onto the A/C and location of the damage from the closest longitudinal skin joints, the affected panel can be determined. For this example, the damage is located on panel 4 - lower side shell.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- **Detailed Location**
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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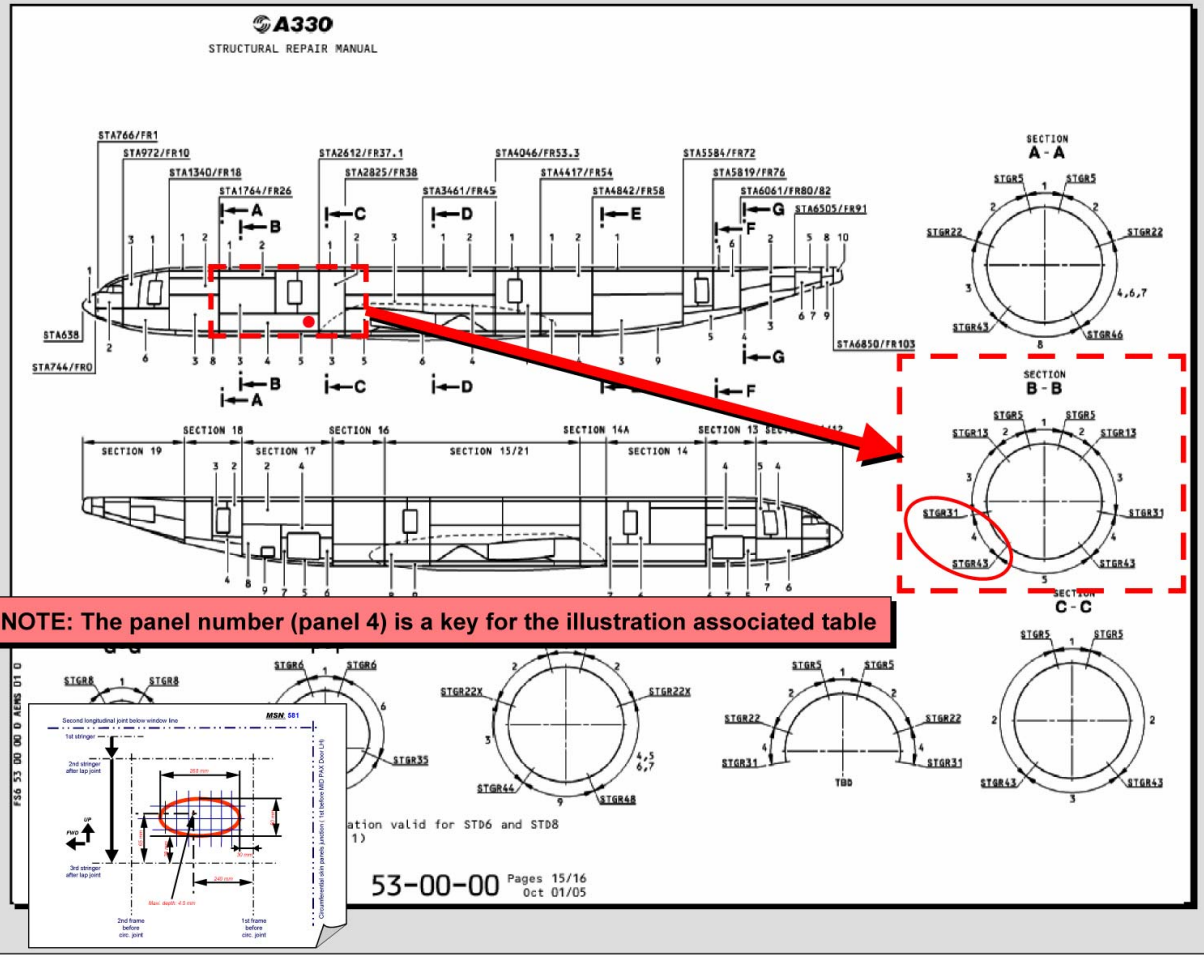
Structural Repair Manual:

Mapping data + skin panel configuration => Affected panel identification + stringer No at longitudinal joints.


A330
STRUCTURAL REPAIR MANUAL
SECTION A - A
SECTION B - B
SECTION C - C
NOTE: The panel number (panel 4) is a key for the illustration associated table
53-00-00 Pages 15/16 Oct 01/05

DETAILED LOCATION - CONT'D

G4J06491 - G0UT1M0 - FM51DG000000001

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

CONT'D

Panel 4 is located between STGR 31LH and 43LH, and FR 26 and 37.1.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- **Detailed Location**
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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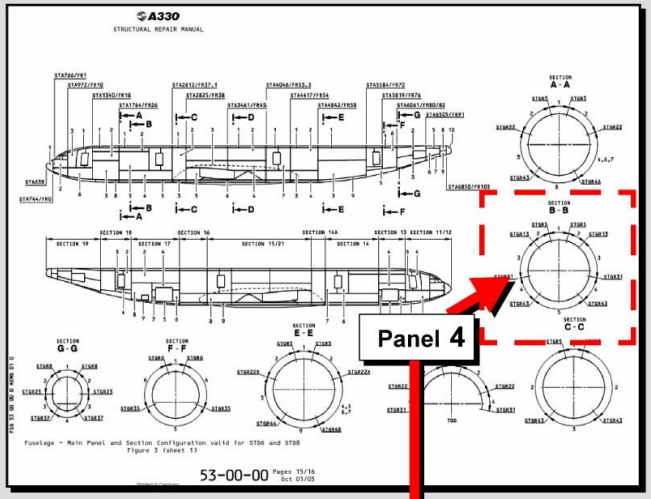
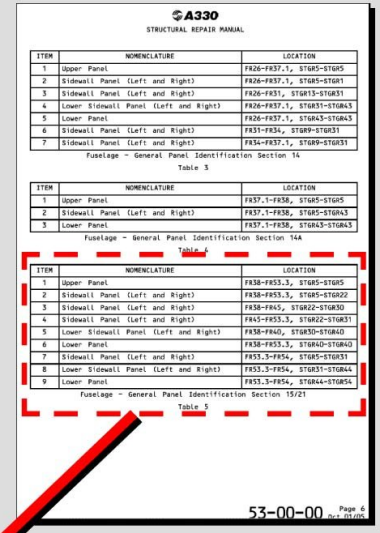
Structural Repair Manual:

Mapping data + skin panel configuration => Affected panel identification + stringer No at longitudinal joints (panel 4, between stringers 31LH and 43LH).





ITEM	NOMENCLATURE	LOCATION
1	Upper Panel	FR26-FR37.1, STGR5-STGR5
2	Sidewall Panel (Left and Right)	FR26-FR37.1, STGR5-STGR1
3	Sidewall Panel (Left and Right)	FR26-FR31, STGR13-STGR31
4	Lower Sidewall Panel (Left and Right)	FR26-FR37.1, STGR31-STGR43
5	Lower Panel	FR26-FR37.1, STGR43-STGR43
6	Sidewall Panel (Left and Right)	FR31-FR34, STGR9-STGR31
7	Sidewall Panel (Left and Right)	FR34-FR37.1, STGR9-STGR31

Fuselage - General Panel Identification Section 14

Table 3

DETAILED LOCATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

CONT'D

To identify the surrounding stringers, this illustration extracted from the AMM chapter 06 can be used but will have to be confirmed during the detailed location step. According to this illustration, the damage is located between STGR 33LH and 34LH.

Damage Identification
Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
Allowable Damage Usage

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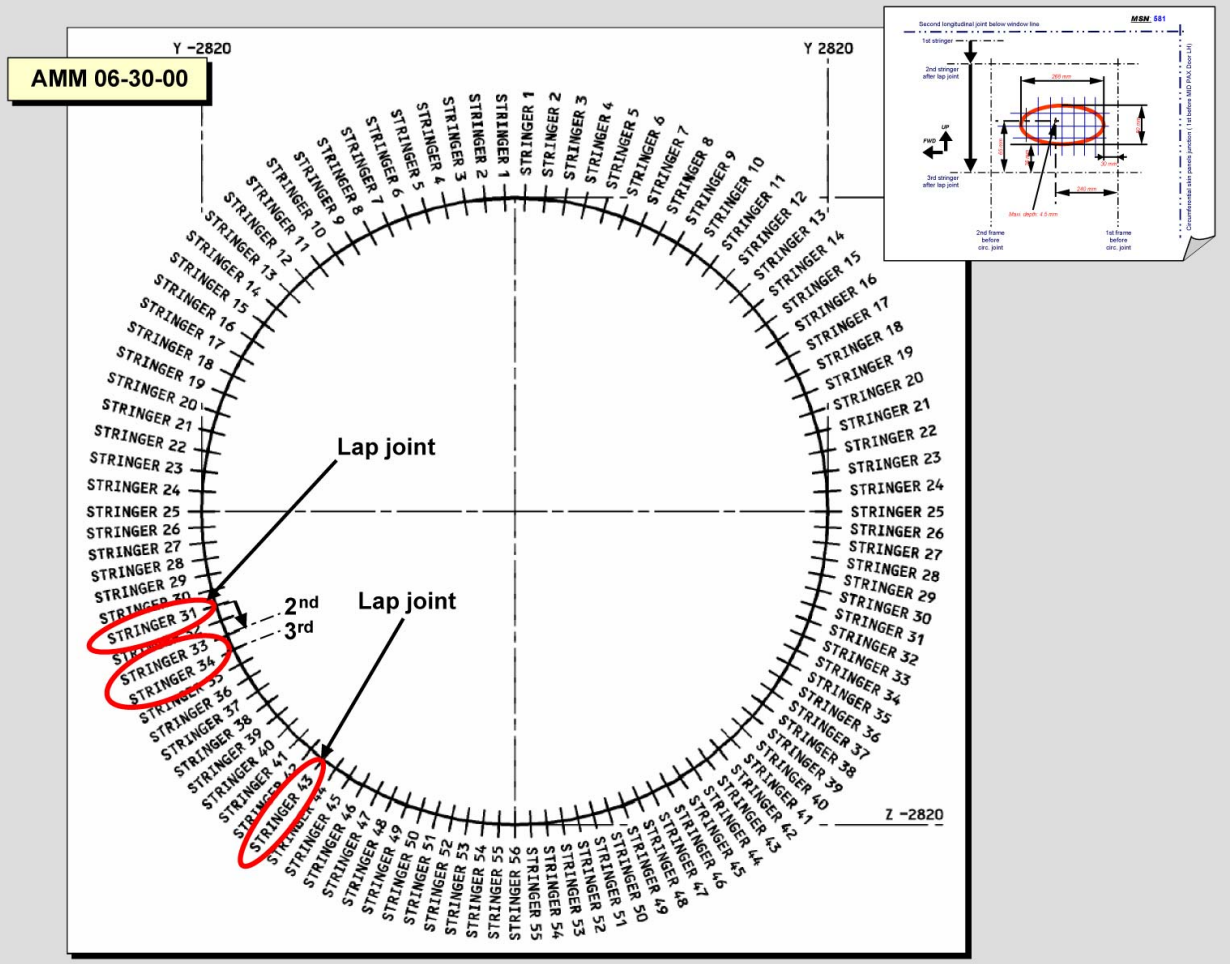
To identify the surrounding stringers, this illustration extacted from the AMM chapter 06 can be used, but will have to be confirmed during the detailed location step. (Damage located between stringers 33LH and 34LH)



DETAILED LOCATION - CONT'D

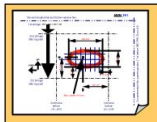
DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

DETAILED LOCATION (continued)

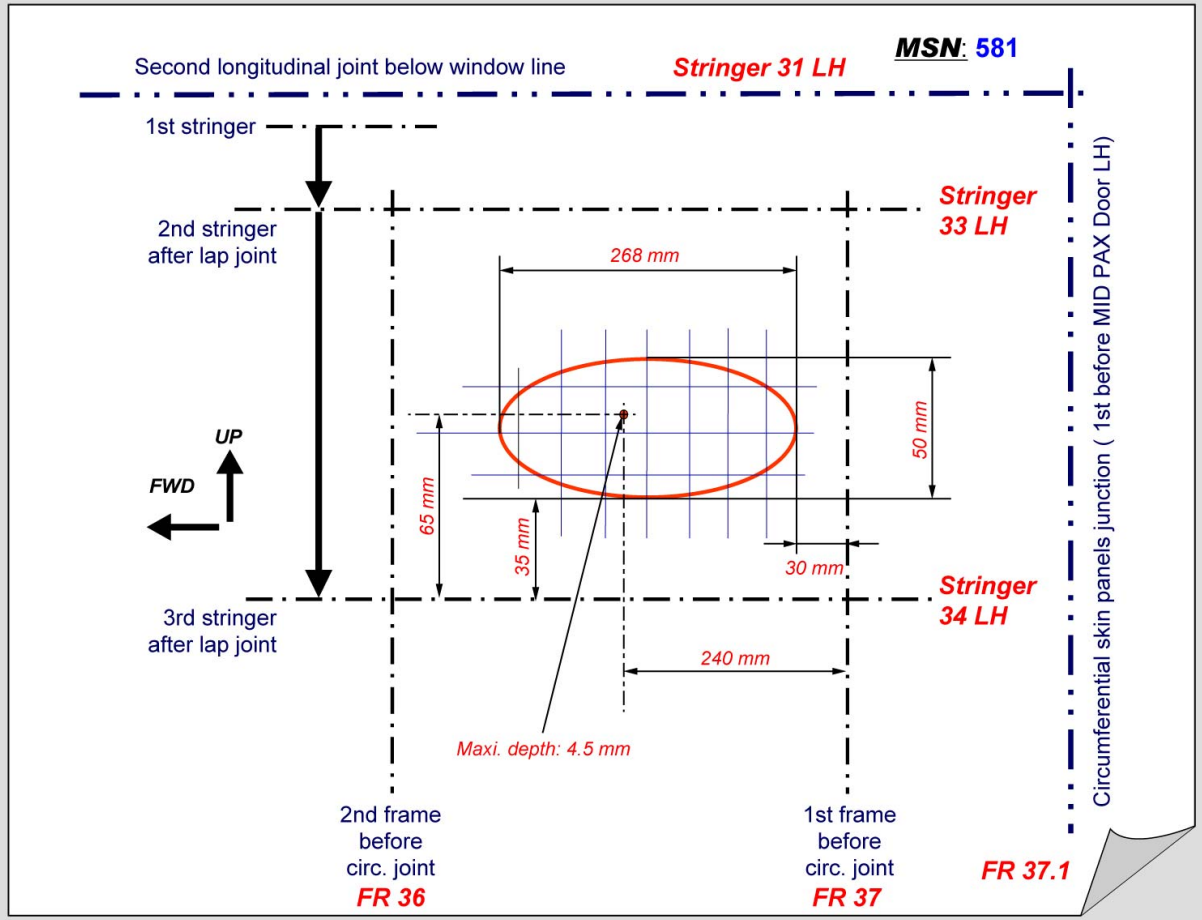
CONT'D

The damage mapping can now be completed with the frame and stringer numbers.

- Damage Identification
- Damage Geographical Location / Measurement
- **Detailed Location**
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage



Mapping:
Finalize the mapping with frame and stringer numbers.



DETAILED LOCATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION

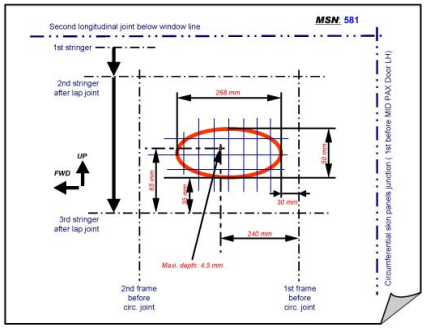
The exact stringer numbers surrounding the damage need to be confirmed and we have to define the skin thickness in the affected area. For this purpose, the information provided in the identification page block of the concerned panel has to be used.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

Objective:
Using the data collected from the A/C and the detailed location of the damage: Identify the affected panel and define the skin thickness in the damaged area.

Damage Identification

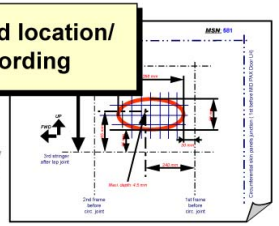
MSN: **581 (STD 8)**

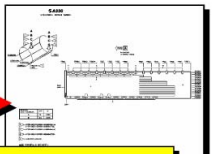


Damage Preliminary Recording
- Geographical location
- Dimensions / Measurements

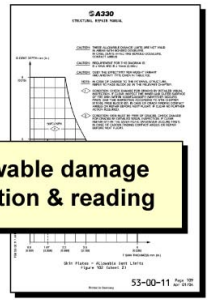
SRM

Detailed location/ recording





Full identification of the damaged structure



Allowable damage selection & reading

STRUCTURE IDENTIFICATION

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The "fuselage section division" illustration of chapter 53-00-00 used before gives the definition of the affected section: Forward fuselage - chapter 53-20-00. The general illustration of 53-20-00 identifies the main structural arrangement of the forward fuselage.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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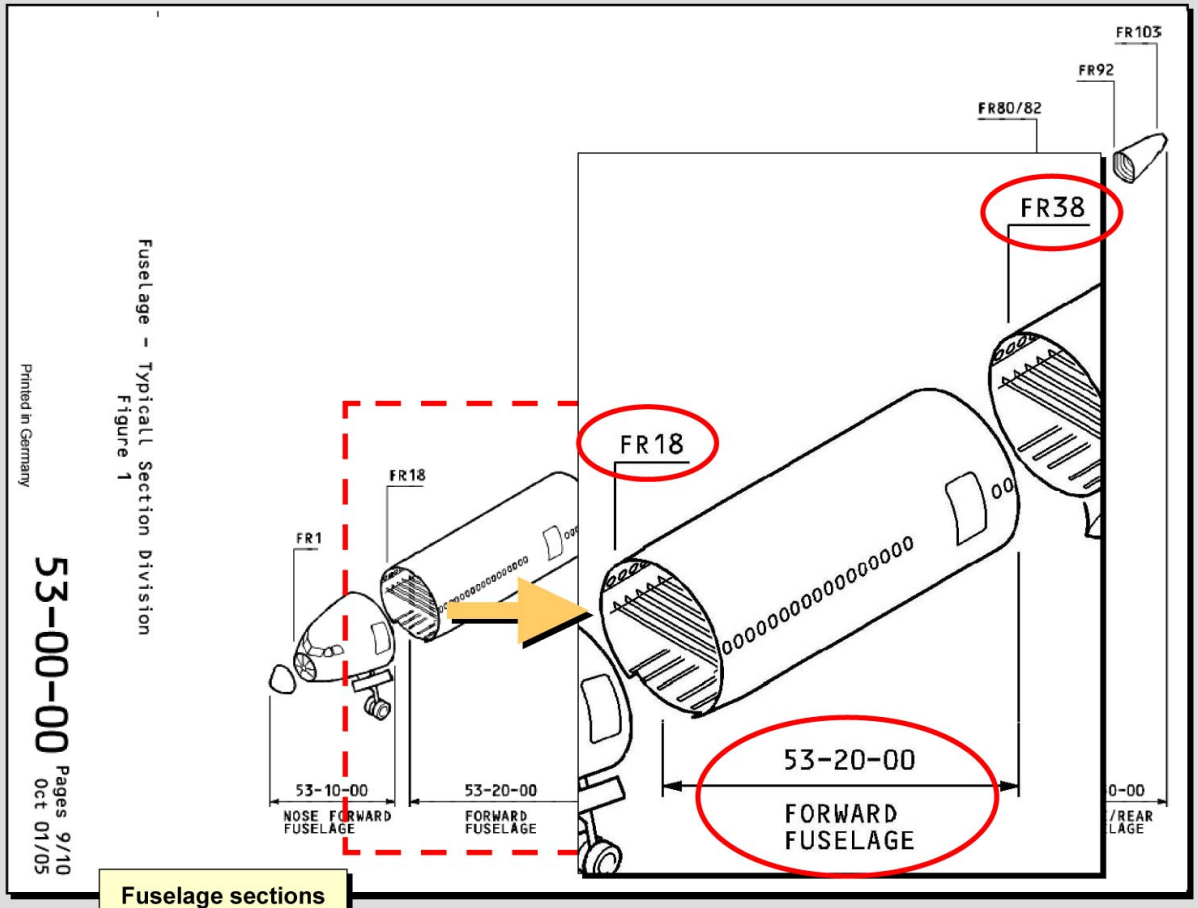
Structural Repair Manual:
The general ilustration of chapter 53-00-00, provides the SRM section (chapter) you have to refer to for the identification of the damaged panel: 53-20-00



Fuselage sections

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The skin plates are part of the main structure, covered by section 53-21-00.

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- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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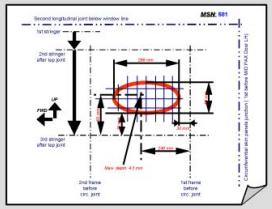
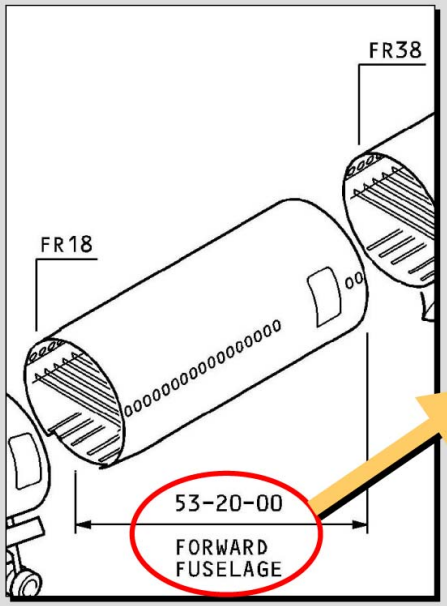
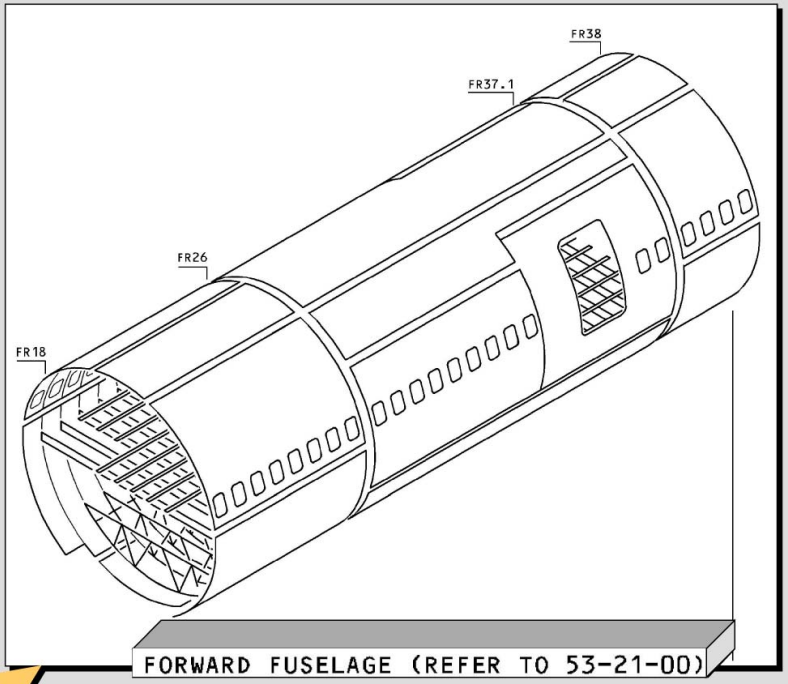
As per the general illustration of 53-20-00 refer to 53-21-00 - Forward fuselage.
The affected panel is part of this main structure.







STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

Following SRM 53-21-00 guidelines, the figure shows that the affected skin panel (skin plate) is item 13. The associated nomenclature refers to SRM 53-21-11 for the full identification of the skin panels.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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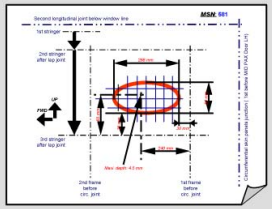
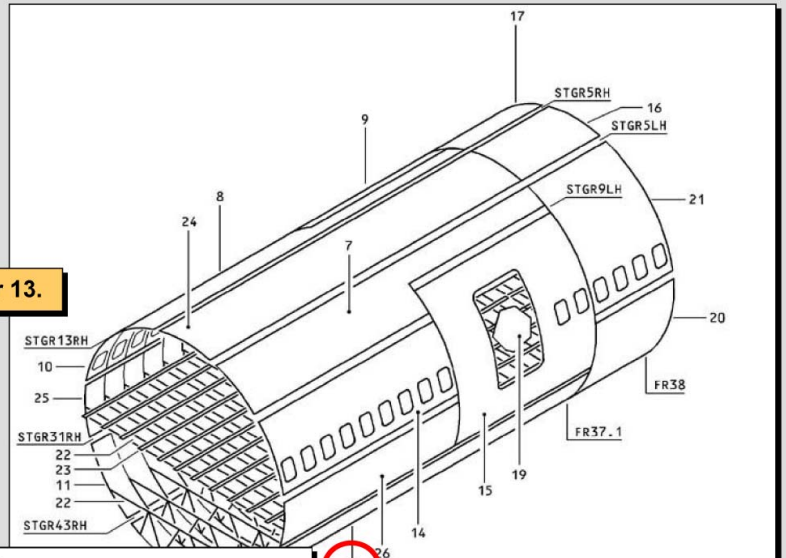
As per the general illustration of 53-21-00 and its associated nomenclature, skin plates (Items 1 to 24) are covered within section 53-21-11.



The damage affects item number 13.



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STRUCTURAL REPAIR MANUAL

MAIN STRUCTURE

1. Structural Arrangement

ITEM	NOMENCLATURE	REFER TO
-	Structural Arrangement	Figure 1
1-24	Skin Plates (Panel 1 thru 24)	53-21-11
-	Frames (not illustrated)	53-21-12
-	Stringers and Skin Stiffeners (not illustrated)	53-21-13

CONFIG-1
CONFIG-2

53-21-00 Page 1 Feb 01/02

ngement, valid for A330-300
gure 1 (sheet 2)

53-21-00 Page 3 Jul 01/02

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

All the skin panels (plates) of the forward fuselage are listed within the nomenclature located at the front page of SRM 53-21-11.
Using the information collected just before (affected panel: lower side panel - left, between FR 26 & 37.1 and STGR 31 & 43), the nomenclature provides the figure number we have to refer to: "Skin plates - LWR parts LH FR 26 to FR 37.1: REFER TO Figure 10 (sheet 1 & 2)".

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- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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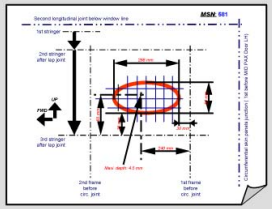
**The first page of 53-21-11 lists the different skin plates of this fuselage section.
the nomenclature gives the figure number we have to refer to:
"Skin plates - LWR parts LH FR 26 to FR 37.1: REFER TO Figure 10 (sheet 1 & 2)".**



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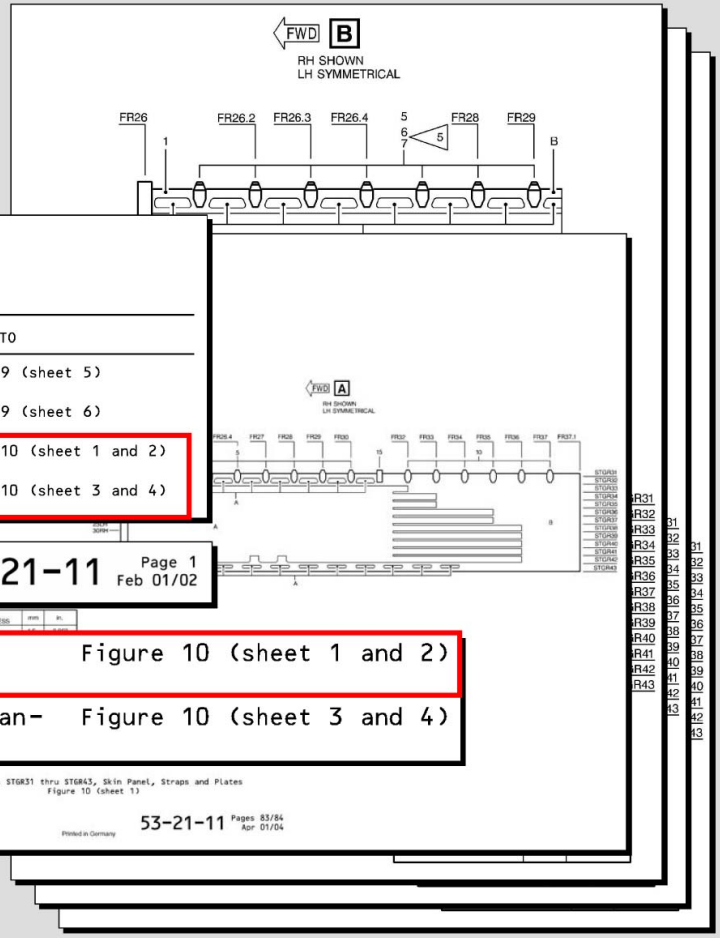
ITEM	NOMENCLATURE	REFER TO
-	FR26-FR31, STGR22LH thru STGR31LH, Skin Panel, Reinforcements and Straps	Figure 9 (sheet 5)
-	FR26-FR31, STGR22RH thru STGR31RH, Skin Panel, Reinforcements and Straps	Figure 9 (sheet 6)
-	FR26-FR37.1, STGR31 thru STGR43, Skin Panel, Straps and Plates	Figure 10 (sheet 1 and 2)
-	FR26-FR38, STGR31 thru STGR43, Skin Pan-el, Straps and Plates	Figure 10 (sheet 3 and 4)



- FR26-FR37.1, STGR31 thru STGR43, Skin Panel, Straps and Plates — Figure 10 (sheet 1 and 2)
- FR26-FR38, STGR31 thru STGR43, Skin Pan-el, Straps and Plates — Figure 10 (sheet 3 and 4)

STRUCTURE IDENTIFICATION - CONT'D

G4J06491 - G0UT1M0 - FM51DG000000001

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The figure 1 is related to four different sheets. As mentioned in the last page, sheets 1 and 2 have to be considered. Different versions of the same panel are illustrated. This represents the evolutions according to production modifications. The next step of the investigation is to find the applicable version for MSN 581.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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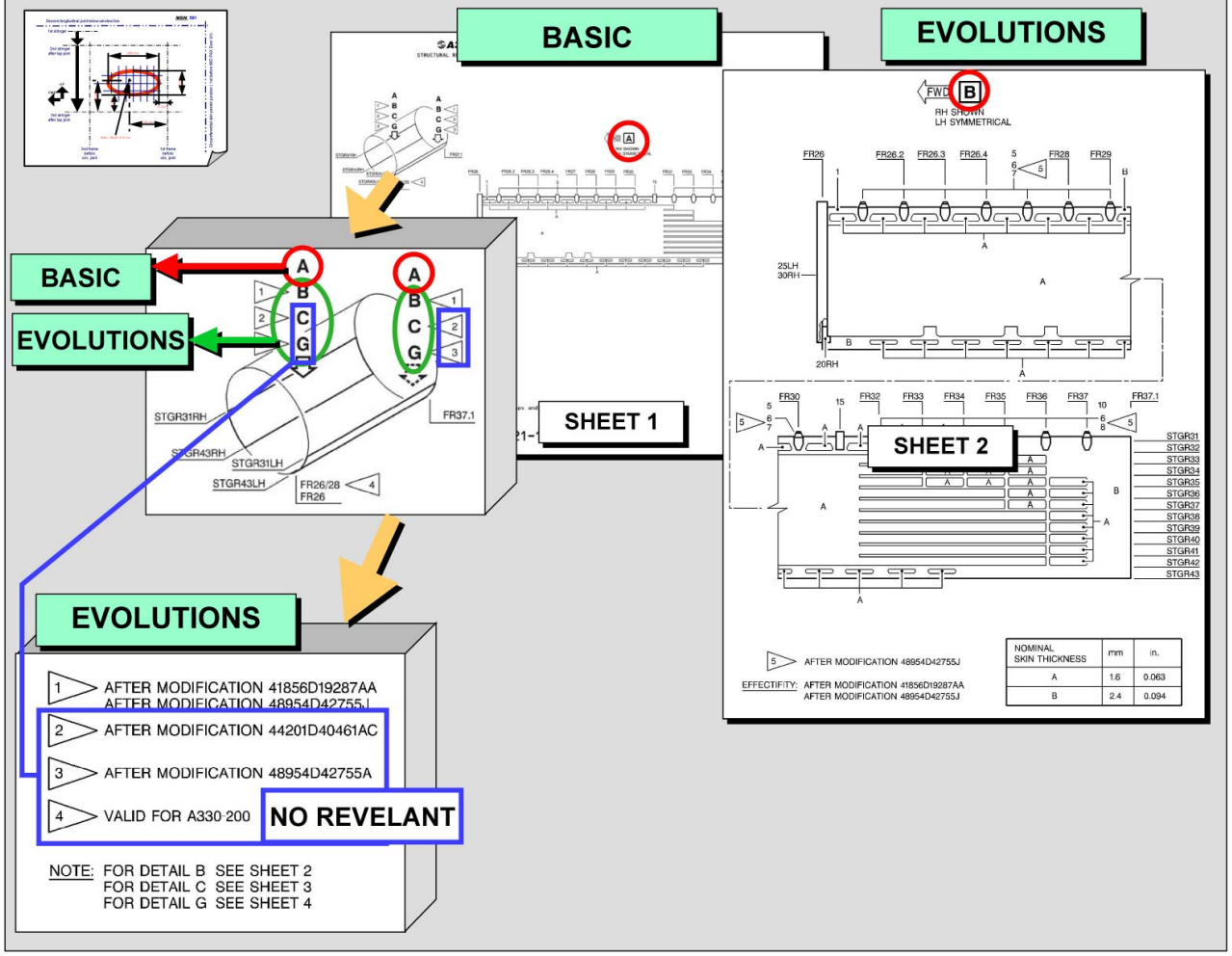
There are different versions of the panels, showing the different evolutions (modifications). The next step of the investigation is to find out the applicable one.



STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

There are two panel configurations illustrated, showing the basic version of the panel (view A) and one other possible version effective after embodiment of production modification(s) (view B). The modification numbers are indicated at the bottom of the page (flag note 1 is associated to view B).
Views C and G refer to sheets 3 and 4 which concerns the A330-200 version; thus, these sheets shall not be taken into account.
The next step of the investigation is to define which of these panels (vew A or B) is installed on the MSN 581.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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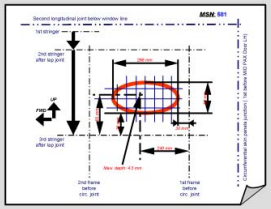
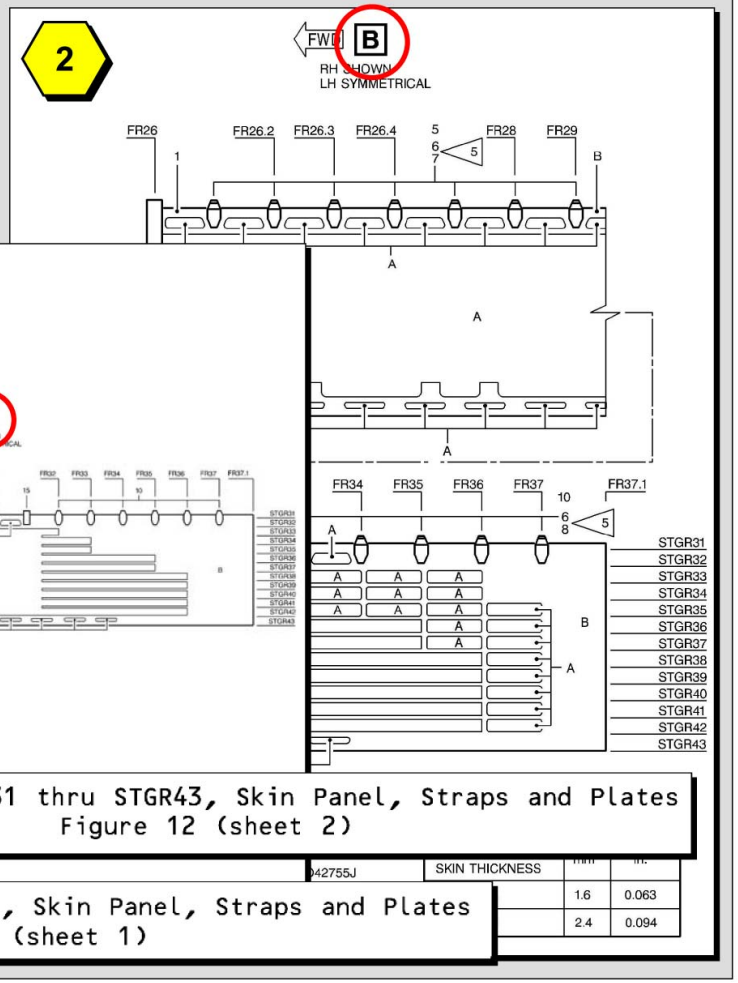
Among these two panels, which one is the relevant; basic version (sheet 1) or evolution (sheet 2)?





FR26-FR37.1, STGR31 thru STGR43, Skin Panel, Straps and Plates
Figure 12 (sheet 2)

FR26-FR37.1, STGR31 thru STGR43, Skin Panel, Straps and Plates
Figure 12 (sheet 1)

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The panel illustrated by the view A has no associated flag note (modification) since this is the basic version.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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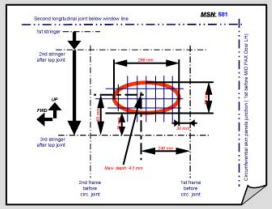

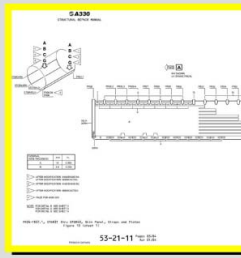

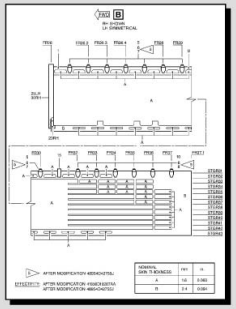

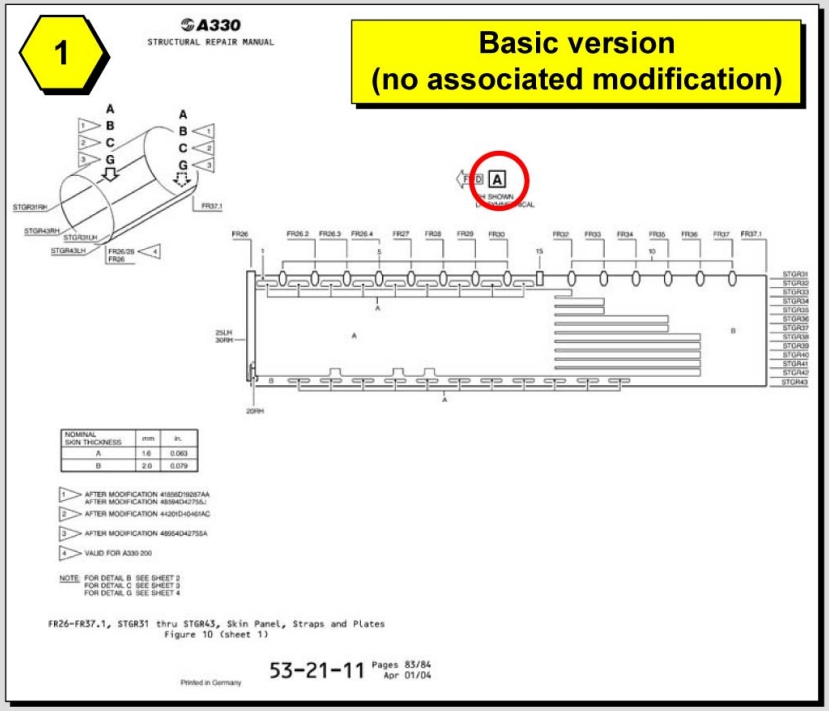

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The other panel version can be installed onto the A/C after the embodiment of modifications 41856D19287AA or 48954D42755J.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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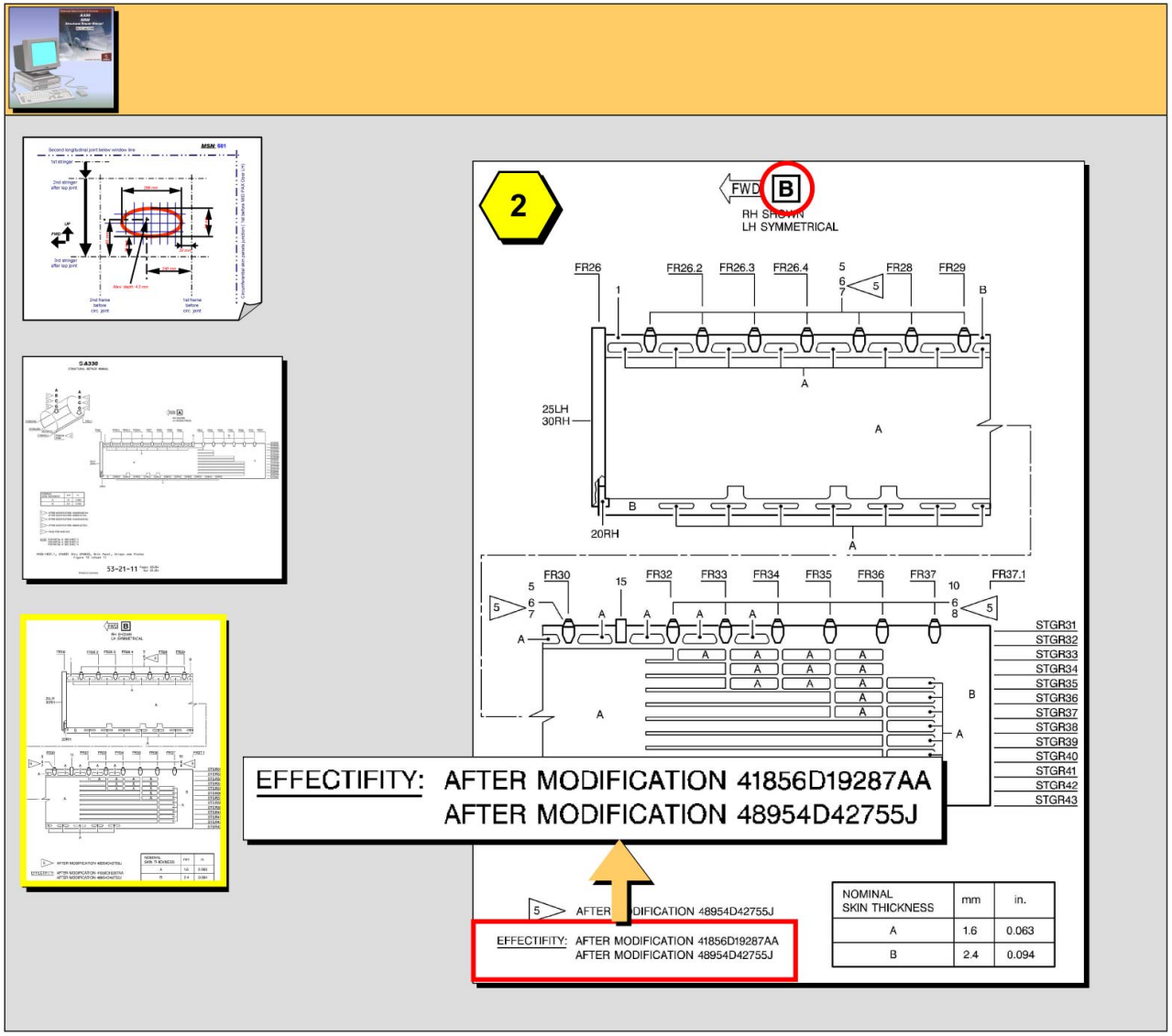

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

To identify the actual panel, the modification numbers have to be compared with the service bulletin/modification list located at the beginning of chapter 53-20-00.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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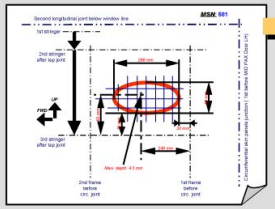
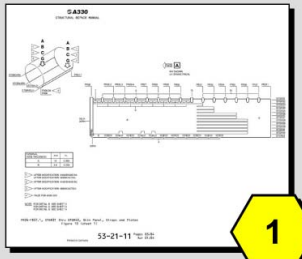
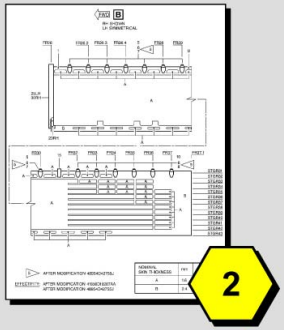
To identify the actual panel, the modification numbers (indicated at the bottom of the page) have to be compared with the service bulletin/modification list located at the beginning of chapter 53-20-00.



MSN: **581 (STD 8)**



1 **Basic version**



2

EFFECTIFITY: AFTER MODIFICATION 41856D19287AA
AFTER MODIFICATION 48954D42755J

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STRUCTURAL REPAIR MANUAL

FORWARD FUSELAGE

1. Modification/Service Bulletin List

This list shows the modifications and the MSN per Standard (STD) of the aircraft which have these modifications. Modifications with the same number, but with a different suffix letter show a different effectivity, refer to column 'S'.

MODIFICATION/ PROPOSAL	S	STD	EFFECTIVITY (MANUFACTURER SERIAL NUMBER)	SERVICE BULLETIN
40001D16508		6	17-999	
40001D16508		7	181-999	
40001D16508		8	256-999	
40001D16508	A	6	37-999	
40001D16508	A	7	181-999	
40001D16508	A	8	256-999	
40001D16508	B	6	17	
40001D16508	C	6	17-87	
40001D16508	D	6	17-37	
40001D16508	E	6	17-30	
40001D16508	F	6	17-112	
40001D16508	G	6	37-112	
40001D16508	J	6	17-209	
40001D16508	J	7	181-211	
40001D16508	K	6	17-999	
40001D16508	K	7	181-522	
40001D16508	K	8	256-515	
40001D16508	L	6	12	
40001D16508	L	7	506,508,513,519,522	
40001D16508	M	6	17-999	
40001D16508	M	7	181-999	
40001D16508	M	8	256-418,420-999	
40001D16508	N	6	12-999	
40001D16508	N	7	181-422	
40001D16508	N	8	256-418,420-421	
40001D16508	P	6	17-999	
40001D16508	P	7	181-505,507,509-511,516,518,521	
40001D16508	P	8	256-515	
40001D16508	Q	6	12-999	
40001D16508	Q	7	181-505,507,509-511,516,518,521	
40001D16508	Q	8	256-999	
40001D16508	R	6	12	
40001D16508	S	6	12-999	
40001D16508	S	7	181-522	

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STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The MSN 581 we are dealing with is a standard 8. The first modification (41856D19287AA) does not apply since effective only for Standard 6,
The second modification (48954D42755J) applies only for MSN 524 up to MSN 549. Our aircraft is also not affected by this modification.
Consequently the basic panel (view A) is the panel installed on MSN 581.
The next step will be to determine the nominal panel thickness is the affected area.

G4J06491 - G0UT1M0 - FM51DG000000001

Damage Identification
Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
Allowable Damage Usage

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    - 53-21-12 – 101
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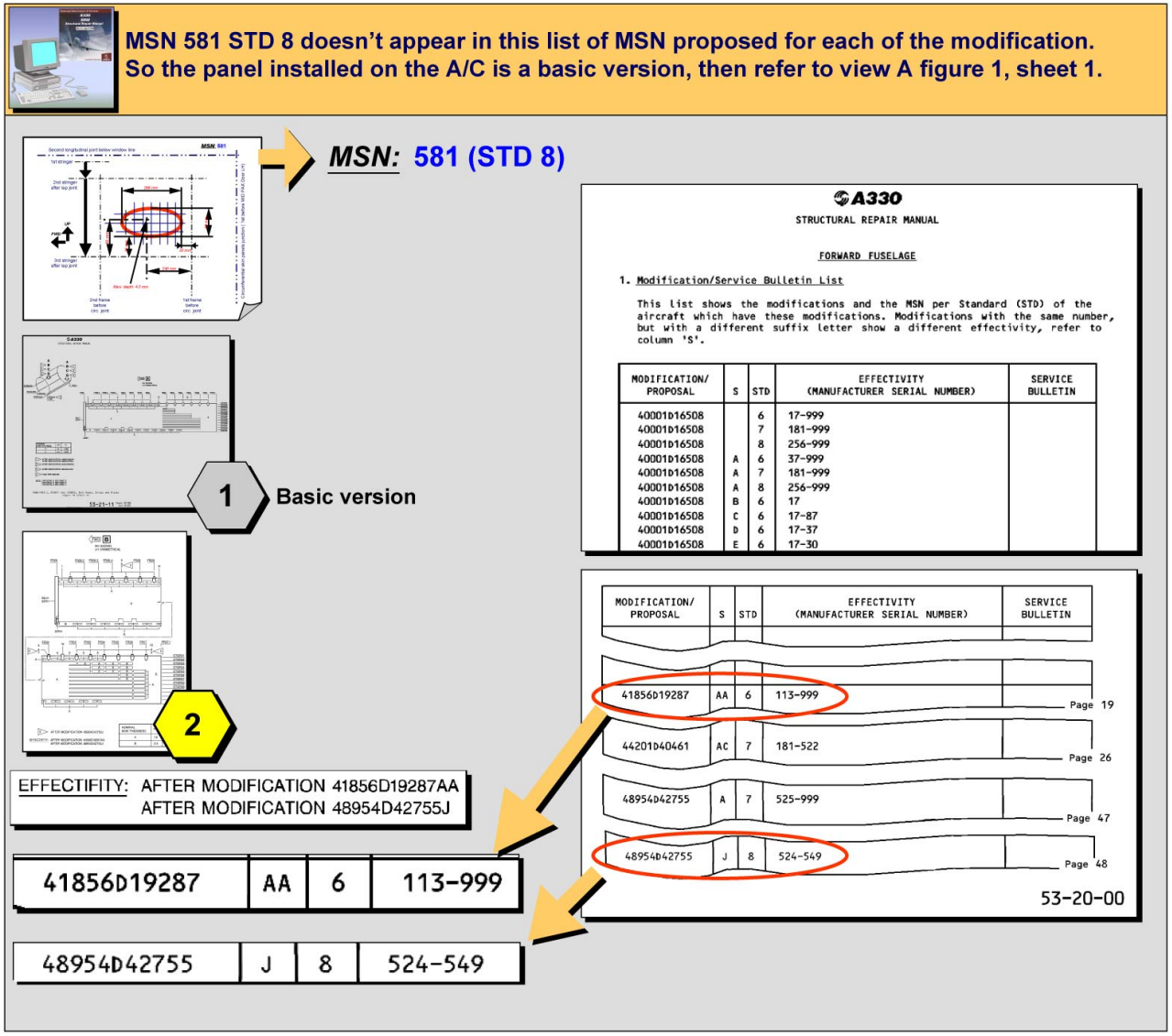
MSN 581 STD 8 doesn't appear in this list of MSN proposed for each of the modification.
So the panel installed on the A/C is a basic version, then refer to view A figure 1, sheet 1.
MSN: 581 (STD 8)
1
Basic version
2
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FORWARD FUSELAGE
1. Modification/Service Bulletin List
This list shows the modifications and the MSN per Standard (STD) of the aircraft which have these modifications. Modifications with the same number, but with a different suffix letter show a different effectivity, refer to column 'S'.
MODIFICATION/ PROPOSAL | S | STD | EFFECTIVITY (MANUFACTURER SERIAL NUMBER) | SERVICE BULLETIN
40001D16508 | | 6 | 17-999
40001D16508 | | 7 | 181-999
40001D16508 | | 8 | 256-999
40001D16508 | A | 6 | 37-999
40001D16508 | A | 7 | 181-999
40001D16508 | A | 8 | 256-999
40001D16508 | B | 6 | 17
40001D16508 | C | 6 | 17-87
40001D16508 | D | 6 | 17-37
40001D16508 | E | 6 | 17-30
MODIFICATION/ PROPOSAL | S | STD | EFFECTIVITY (MANUFACTURER SERIAL NUMBER) | SERVICE BULLETIN
41856D19287 | AA | 6 | 113-999 | Page 19
44201D40461 | AC | 7 | 181-522 | Page 26
48954D42755 | A | 7 | 525-999 | Page 47
48954D42755 | J | 8 | 524-549 | Page 48
53-20-00
EFFECTIFITY: AFTER MODIFICATION 41856D19287AA
AFTER MODIFICATION 48954D42755J
41856D19287 | AA | 6 | 113-999
48954D42755 | J | 8 | 524-549

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The damage is located between FR 36 and 37, and is located between the second and the third stringer from STGR 31 (longitudinal skin joint reference). This information can be reported onto the illustration (view A) and gives the nominal skin thickness in the damaged area (refer to the thickness code table).

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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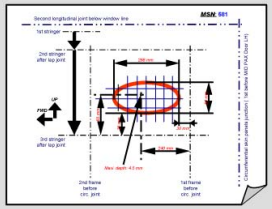
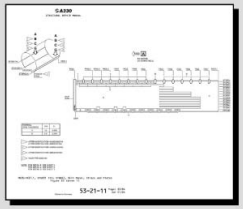
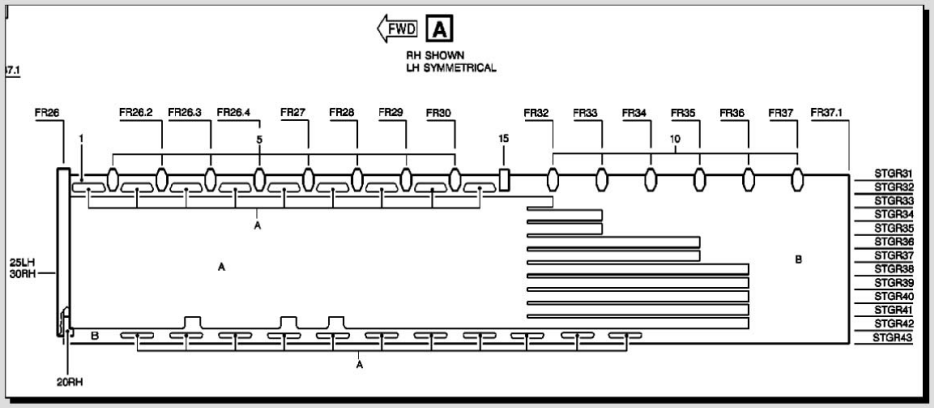
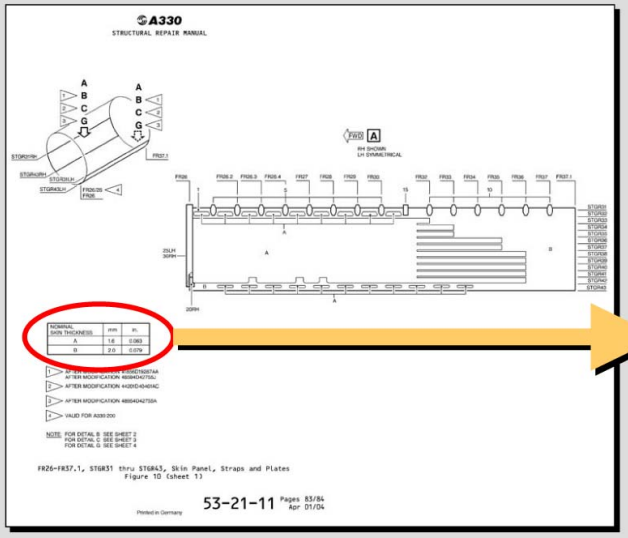
The skin panel thickness at damage location can be determined; for this purpose, we shall refer to the thickness code table.









NOMINAL SKIN THICKNESS	mm	in.
A	1.6	0.063
B	2.0	0.079

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

STRUCTURE IDENTIFICATION (continued)

CONT'D

The damage is located between FR 36 and 37, and is located between the second and the third stringer from STGR 31 (longitudinal skin joint reference).
This information can be reported onto the illustration and gives:
- the nominal skin thickness in the damaged area (code B, giving 2.0 mm (0.079 in)),
- the stringer location: damage located between STGR 33LH and 34LH.

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- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- **Structure Identification**
- Allowable Damage Information
- Allowable Damage Usage

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    - 53-21-12 – 101
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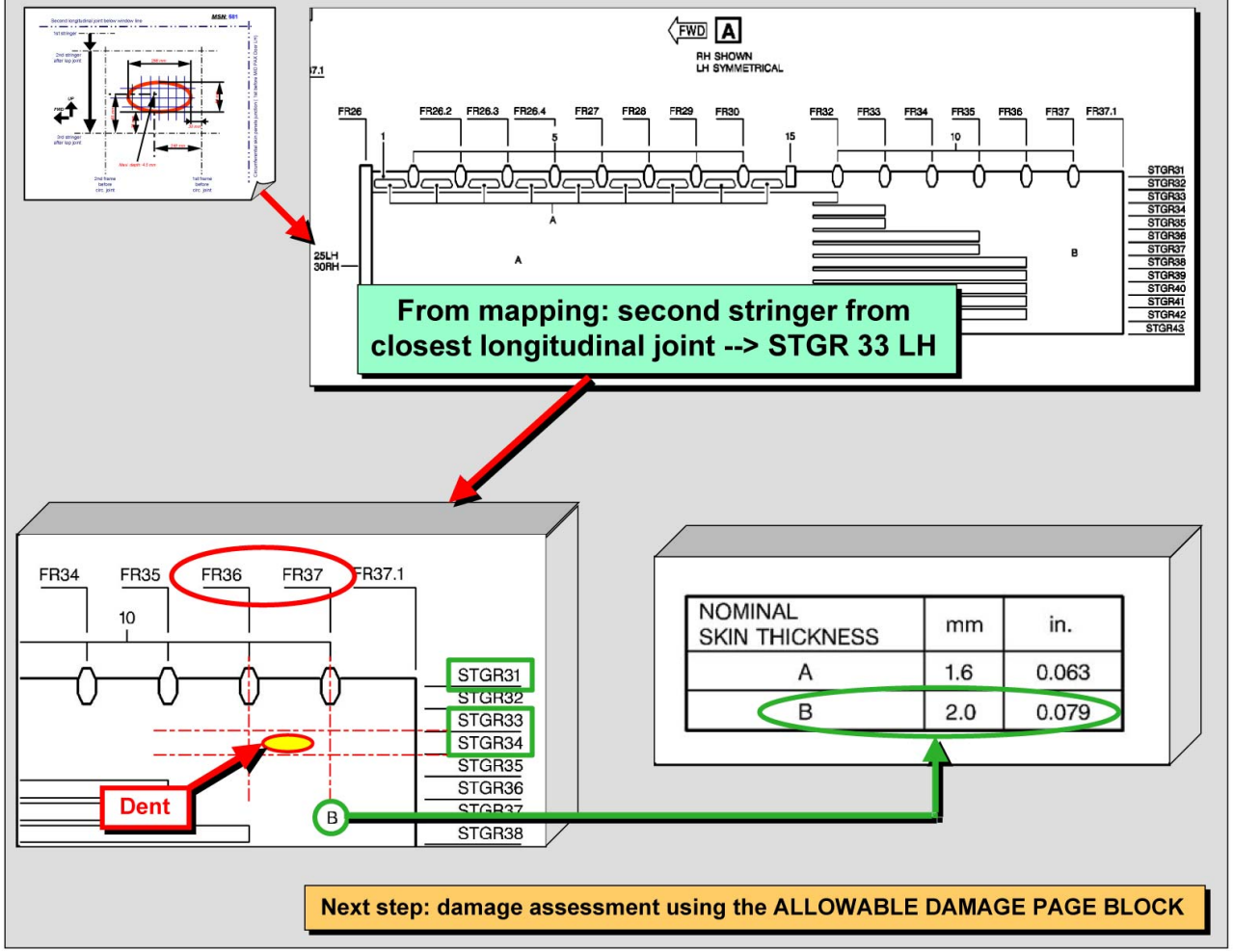
The damage is located between the second and the third stringer from STGR 31 (longitudinal skin joint reference). This information can be reported onto the illustration and gives the nominal skin thickness in the damaged area, and the stringer location.


FWD A
RH SHOWN
LH SYMMETRICAL
FR26 FR26.2 FR26.3 FR26.4 FR27 FR28 FR29 FR30 FR32 FR33 FR34 FR35 FR36 FR37 FR37.1
STGR31 STGR32 STGR33 STGR34 STGR35 STGR36 STGR37 STGR38 STGR39 STGR40 STGR41 STGR42 STGR43
25LH 30RH
From mapping: second stringer from closest longitudinal joint --> STGR 33 LH
FR34 FR35 FR36 FR37 FR37.1
Dent
B
NOMINAL SKIN THICKNESS | mm | in.
A | 1.6 | 0.063
B | 2.0 | 0.079

Next step: damage assessment using the ALLOWABLE DAMAGE PAGE BLOCK

STRUCTURE IDENTIFICATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION

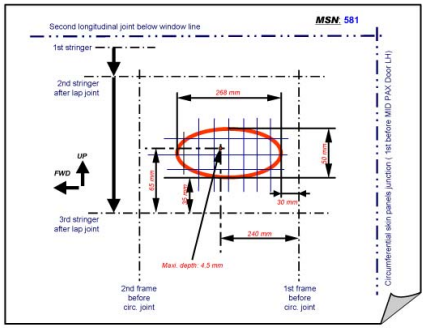
GENERAL

The damaged structure has been identified and located, we can now start the allowable damage selection and reading.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- **Allowable Damage Information**
- Allowable Damage Usage

Objective:
The damaged structure has been identified and located; we can now start the allowable damage selection and reading procedure.

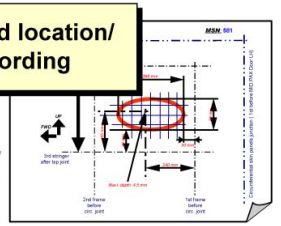
MSN: 581 (STD 8)



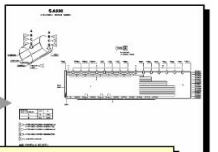
Damage Preliminary Recording
- Geographical location
- Dimensions / Measurements

SRM

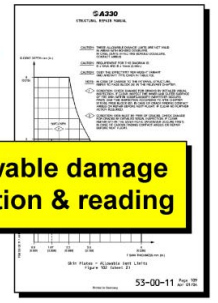
Detailed location/ recording



Full identification of the damaged structure



Allowable damage selection & reading



ALLOWABLE DAMAGE INFORMATION - GENERAL

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

To start, refer to the page block 101 of the relevant chapter/section (53-21-11), and start to read carefully the procedure. In the considered example, there is no specific allowable damage for this skin section, chapter 53-00-11 page block 101 must be used to determine if the damage is allowable or not.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- **Allowable Damage Information**
- Allowable Damage Usage

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    - 53-21-12 – 001
    - 53-21-12 – 101
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To start the damage assessment, refer to the page block 101 of the relevant chapter/section (53-21-11), and start to read carefully the procedure. In the considered example, there is no specific allowable damage for this skin section.

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STRUCTURAL REPAIR MANUAL

SKIN PLATES

1. General

CAUTION: HIDDEN DAMAGE CAN LEAD TO A FAILURE OF THE REPAIR SURROUNDING STRUCTURE.

A. This topic contains allowable damage data for the skin plates between FR18 thru FR38.

NOTE: For definition of allowable damage, refer to Chapter 51-11-11.

NOTE: For Damage/Repair Data Recording, refer to Chapter 51-11-15.

NOTE: For repair of Minor Damage, refer to Chapter 51-73-00.

NOTE: For repair of Corroded Areas, refer to Chapter 51-74-00.

2. Allowable Damage

- For Skin Plates
Compare the damage in question with Table 101 - damage Criteria, given in Chapter 53-00-11 Page Block 101 - SKIN PLATES.

2. Allowable Damage

- For Skin Plates
Compare the damage in question with Table 101 - damage Criteria, given in Chapter 53-00-11 Page Block 101 - SKIN PLATES.

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No specific allowable damage for this section. Use general allowable damage for skin panels in 53-00-11 section.

ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

A special attention shall be paid to the notes and cautions.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- **Allowable Damage Information**
- Allowable Damage Usage

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A special attention shall be paid to the notes and cautions.

Careful Reading

Pay a particular attention to the caution notes within allowable damage paragraph.

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STRUCTURAL REPAIR MANUAL

SKIN PLATES

CAUTION: OBEY THE REPAIR APPLICABILITY PER MODIFICATION GIVEN IN THE RELEVANT REPAIR.

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN THE RELEVANT PARAGRAPH.

1. General

CAUTION: HIDDEN DAMAGE CAN LEAD TO A FAILURE OF THE REPAIR OR SURROUNDING STRUCTURE.

CAUTION: DAMAGE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND ANGLE OF ATTACK SENSORS, HAVE TO COMPLY WITH THE STRUCTURAL ALLOWABLE LIMITS GIVEN IN THIS CHAPTER AND THE AERODYNAMIC SMOOTHNESS REQUIREMENTS GIVEN IN PARAGRAPH 4..

CAUTION: THE REWORKED AREA MUST BE CHECKED TO ENSURE THAT THE ALLOWABLE DAMAGE LIMITS HAVE NOT BEEN EXCEEDED. WHEN THE LIMITS ARE EXCEEDED A REPAIR IS NECESSARY.

A. This topic contains allowable damage data for the skin plates. Allowable damage is damage for which an immediate structural repair is not necessary. You must blend out the allowable damage and protect the surface on the component.

NOTE: For definition of allowable damage refer to Chapter 51-11-11

NOTE: For Damage/Repair Data Recording refer to Chapter 51-11-15.

NOTE: For repair of MINOR DAMAGE refer to Chapter 51-73-00.

NOTE: For repair of CORRODED AREAS refer to Chapter 51-74-00.

2. Allowable Damage

A. Refer to Paragraph 3. - Damage Criteria - to find the limits of allowable damage. These include data for the skin plates.

B. The column 'Action or Repair' in the relevant identification page block gives references for the available repairs. These are necessary if the allowable damage limits are more than shown.

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ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

To keep on with the damage assessment procedure, the allowable damage paragraph refers to the damage criteria table 101 (paragraph 3). In this table, the paragraph 3C has to be considered for dents.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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    - 53-00-11 – 201
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    - 53-00-12 – 201
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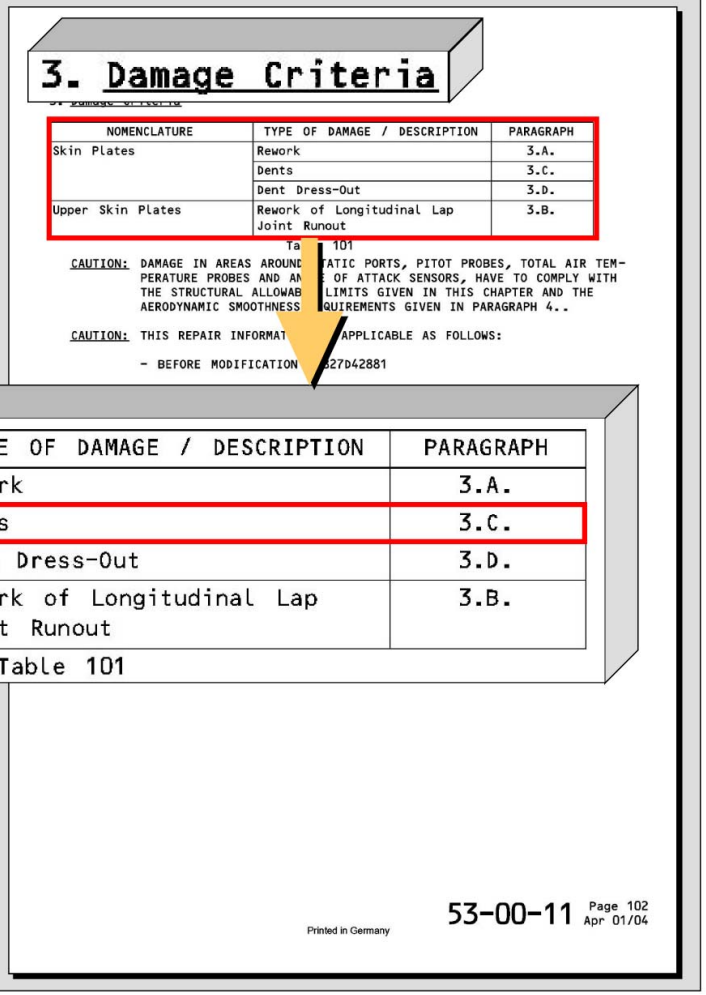
Refer to paragraph 3 - damage criteria - to find the limits of allowable damage.
For dents the relevant paragraph is Paragraph 3.C.



3. Damage Criteria

NOMENCLATURE	TYPE OF DAMAGE / DESCRIPTION	PARAGRAPH
Skin Plates	Rework	3.A.
	Dents	3.C.
	Dent Dress-Out	3.D.
Upper Skin Plates	Rework of Longitudinal Lap Joint Runout	3.B.

Table 101

CAUTION: DAMAGE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND AN OF ATTACK SENSORS, HAVE TO COMPLY WITH THE STRUCTURAL ALLOWAB LIMITS GIVEN IN THIS CHAPTER AND THE AERODYNAMIC SMOOTHNESS QUIREMENTS GIVEN IN PARAGRAPH 4..

CAUTION: THIS REPAIR INFORMAT APPLICABLE AS FOLLOWS:

- BEFORE MODIFICATION 27D42881

NOMENCLATURE	TYPE OF DAMAGE / DESCRIPTION	PARAGRAPH
Skin Plates	Rework	3.A.
	Dents	3.C.
	Dent Dress-Out	3.D.
Upper Skin Plates	Rework of Longitudinal Lap Joint Runout	3.B.

Table 101

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ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

As mentioned in a caution at the beginning of the allowable damage pages, the allowable damage applicability have to be checked, using the weight variant table (table 102) given at the beginning of the paragraph. The actual weight variant information should come from the engineering or maintenance control.

Damage Identification
Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
Allowable Damage Usage

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The allowable damage applicability has to be checked, using the effectivity per weight variant table (table 102).

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIR-CRAFT TYPE GIVEN IN TABLE 102.

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIR-CRAFT TYPE GIVEN IN TABLE 102.

CAUTION: THE ALLOWABLE DAMAGE LIMITS GIVEN IN FIGURE 102, SHEET 2 AND 3 ARE NOT APPLICABLE IN AREAS WITH BONDED DOUBLERS. IN CASE OF DENTS AFFECTING BONDED DOUBLERS, CONTACT AIRBUS.

CAUTION: DAMAGE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND ANGLE OF ATTACK SENSORS, HAVE TO COMPLY WITH THE STRUCTURAL ALLOWABLE LIMITS GIVEN IN THIS CHAPTER AND THE AERODYNAMIC SMOOTHNESS REQUIREMENTS GIVEN IN PARAGRAPH 4..

Aircraft Type

<1> Refer to Figure 102 turbed skin with ski

Refer to Figure 102 turbed skin with sk maining areas

<2> Refer to F turbed ski rounding p

Refer to F turbed ski maining ar

NOTE: Refer to the SRM, and their type.

NOTE: This allo areas:

- FR1 thru FR18 able dent lim

C. Skin Plates - Allowable Dent Limits

AIRCRAFT	WEIGHT VARIANT
A330-2XX	020, 021, 022 <1>
A330-3XX	000, 001, 002, 003, 004, 010, 012, 020, 022 <2>

Effectivity per Weight Variant and Aircraft Type

Table 102

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The Weight Variant (WV) to be considered for allowable damage may be different from the WV at A/C delivery or the today's WV due to application of Service Bulletins.

This information should come from Engineering or Maintenance control.

ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

The information coming from engineering shows that MSN 581 is at weight variant 020. Checking table 102, weight variant 020 is included in and thus the following allowable damage information is applicable.

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Damage Identification

Damage Geographical Location / Measurement

Detailed Location

Structure Identification

Allowable Damage Information

Allowable Damage Usage

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Weight Variant 020 is included in the table, thus, the following allowable damage information can be used.

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN TABLE 102.

CAUTION: THE ALLOWABLE DAMAGE LIMITS GIVEN IN FIGURE 102, SHEET 2 AND 3 ARE NOT APPLICABLE IN AREAS WITH BONDED DOUBLERS. IN CASE OF DENTS AFFECTING BONDED DOUBLERS, CONTACT AIRBUS.

CAUTION: DAMAGE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND ANGLE OF ATTACK SENSORS, HAVE TO COMPLY WITH THE STRUCTURAL ALLOWABLE LIMITS GIVEN IN THIS CHAPTER AND THE AERODYNAMIC SMOOTHNESS REQUIREMENTS GIVEN IN PARAGRAPH 4..

C. Skin Plates - Allowable Dent Limits

NOTE: This allowable damage information is applicable for dents to the skin plates in the areas between FR18 thru FR38 and FR53.3 thru FR80/82 and is valid as shown in Table 102.

AIRCRAFT	WEIGHT VARIANT
A330-2XX	020, 021, 022 <1>
A330-3XX	000, 001, 002, 003, 004, 010, 012, 020, 022 <2>

Effectivity per Weight Variant and Aircraft Type

Table 102

<1> Refer to Figur... turbed skin...

Refer to F... turbed ski... maining ar...

<2> Refer to F... turbed ski... rounding p...

Refer to F... turbed ski... maining ar...

NOTE: Refer to ... the SRM, ... and their ... type.

NOTE: This allow... areas:

- FR1 thru FR18. Refer to Chapter 53-11-11 Page Block 101 to find the allowable dent limits applicable in this area.

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AIRCRAFT	WEIGHT VARIANT
A330-2XX	020, 021, 022 <1>
A330-3XX	000, 001, 002, 003, 004, 010, 012, 020, ...

Effectivity per Weight Variant and Aircraft Type

Table 102

For the EXAMPLE:
MSN 581 = WV 020

ALLOWABLE DAMAGE INFORMATION VALID FOR MSN 581

ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

The second caution at the beginning of the allowable damage pages deals with bonded doublers; if the dent affects bonded doublers (see next page), the operator has to contact Airbus. The third caution at the beginning of the allowable damage pages deals with damage located in special areas (ports, probes, sensors, etc...), located at the nose forward fuselage. The damage being located FR 36 and 37 (aft of ports, probes and sensors), this last limitation does apply.

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- **Allowable Damage Information**
- Allowable Damage Usage

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The nomenclature associated to the relevant SRM figure shows that there is no bonded doubler in the damage area: these cautions are not applicable.

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIR-CRAFT TYPE GIVEN IN TABLE 102.

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIR-CRAFT TYPE GIVEN IN TABLE 102.

CAUTION: THE ALLOWABLE DAMAGE LIMITS GIVEN IN FIGURE 102, SHEET 2 AND 3 ARE NOT APPLICABLE IN AREAS WITH BONDED DOUBLERS. IN CASE OF DENTS AFFECTING BONDED DOUBLERS, CONTACT AIRBUS.

CAUTION: DAMAGE IN AREAS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMPERATURE PROBES AND ANGLE OF ATTACK SENSORS, HAVE TO COMPLY WITH THE STRUCTURAL ALLOWABLE LIMITS GIVEN IN THIS CHAPTER AND THE AERODYNAMIC SMOOTHNESS REQUIREMENTS GIVEN IN PARAGRAPH 4..

Aircraft Type
Table 102

FWD A
RH SHOWN

FR26 FR26.2 FR26.3 FR26.4 FR27 FR28 FR29 FR30 FR32 FR33 FR34 FR35 FR36 FR37 FR37.1

STGR31 STGR32 STGR33 STGR34 STGR35 STGR36 STGR37 STGR38 STGR39 STGR40 STGR41 STGR42 STGR43

25LH 30RH 20RH

ITEM	NOMENCLATURE	SPECIFICAT AND/OR SECTION C
1	Panel, skin	T351 ABS5043A02
1A	Panel, skin	T351 ABS5043A02
1B	Panel, skin	T351 ABS5043A02
1C	Panel, skin	T351 ABS5043A02
1D	Panel, skin	T351 ABS5043A02
1E	Panel, skin	T351 ABS5043A02
5	Strap, assy	
5A	Strap	3.7164.1 LN9297H10
6	Strap	3.7164.1 LN9297H10
7	Key	3.1354T35 DAN26-6
8	Key	3.1354T35 DAN26-6
10	Strap, assy	
15	Buttstrap, cross	T351 ABS5044A02

Key to Figure 10
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SEE NEXT SLIDE

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ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

The skin thickness in damaged area is 2.0 mm (0.079 in) then, the operator shall refer to figure 102 sheet 2 for allowable damage information. Read carefully the note; some limitations concerning the areas where allowable damage information is not applicable may be indicated in this section.

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

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For A330-3XX A/C, refer to Note <2>.
Then refer to figure 102 sheet 2.

CAUTION: OBEY THE ALLOWABLE DAMAGE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN TABLE 102.

AIRCRAFT	WEIGHT VARIANT
A330-2XX	020, 021, 022 <1>
A330-3XX	000, 001, 002, 003, 004, 010, 012, 020, 022 <2>

Effectivity per Weight Variant and Aircraft Type

Table 102

Aircraft Type

Table 102

<1> Refer to Figure 102 sheet 3 for allowable damage information on undisturbed skin with skin thickness T = 1.6 mm (0.063 in.)

<2> Refer to Figure 102 sheet 3 for allowable damage information on undisturbed skin with skin thickness T = 1.6 mm (0.063 in.) and Door surrounding panels between FR31 thru FR37.1 and STGR9 thru STGR31 LH/RH.

Refer to Figure 102 sheet 2 for allowable damage information on undisturbed skin with skin thickness T > 1.6 mm (0.063 in.) and for the remaining areas (other door surrounding panels).

NOTE: This allowable damage information is not applicable in the following areas:

NOTE: This allowable damage information is not applicable in the following areas:

- FR1 thru FR18. Refer to Chapter 53-11-11 Page Block 101 to find the allowable dent limits applicable in this area.

ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

This procedure (see figure 102, sheet 1) enables the operator to measure the dent parameters from inside or from outside.

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Damage Identification
Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
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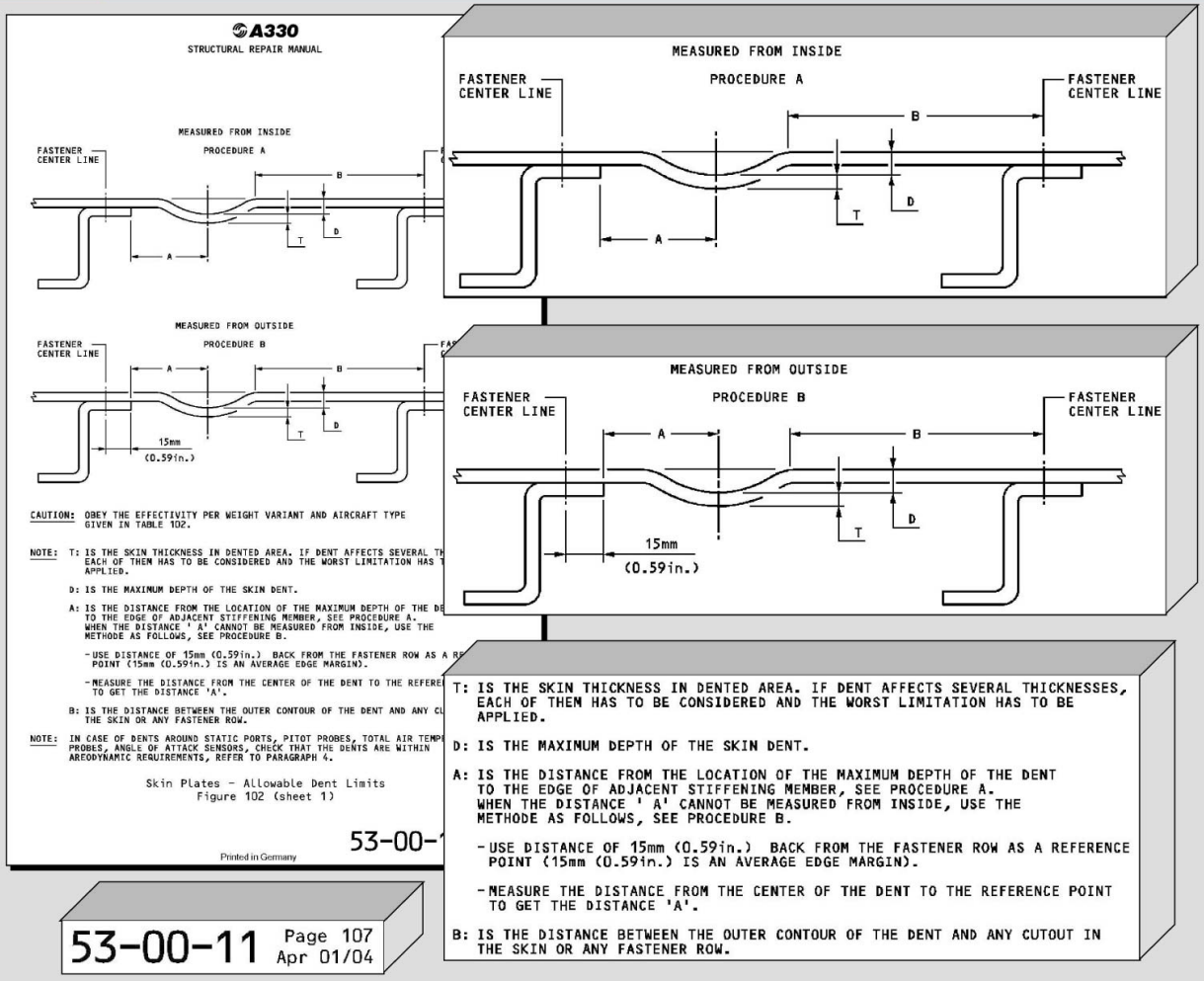
This procedure (figure 102, sheet 1) enables the operator to measure the dent parameters from inside or from outside.


A330
STRUCTURAL REPAIR MANUAL
MEASURED FROM INSIDE
PROCEDURE A
FASTENER CENTER LINE
MEASURED FROM OUTSIDE
PROCEDURE B
15mm
(0.59in.)
CAUTION: OBEY THE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN TABLE 102.
NOTE: T: IS THE SKIN THICKNESS IN DENTED AREA. IF DENT AFFECTS SEVERAL TH EACH OF THEM HAS TO BE CONSIDERED AND THE WORST LIMITATION HAS T APPLIED.
D: IS THE MAXIMUM DEPTH OF THE SKIN DENT.
A: IS THE DISTANCE FROM THE LOCATION OF THE MAXIMUM DEPTH OF THE DE TO THE EDGE OF ADJACENT STIFFENING MEMBER, SEE PROCEDURE A. WHEN THE DISTANCE ' A' CANNOT BE MEASURED FROM INSIDE, USE THE METHODE AS FOLLOWS, SEE PROCEDURE B.
- USE DISTANCE OF 15mm (0.59in.) BACK FROM THE FASTENER ROW AS A RE POINT (15mm (0.59in.) IS AN AVERAGE EDGE MARGIN).
- MEASURE THE DISTANCE FROM THE CENTER OF THE DENT TO THE REFERE TO GET THE DISTANCE 'A'.
B: IS THE DISTANCE BETWEEN THE OUTER CONTOUR OF THE DENT AND ANY CU THE SKIN OR ANY FASTENER ROW.
NOTE: IN CASE OF DENTS AROUND STATIC PORTS, PITOT PROBES, TOTAL AIR TEMP PROBES, ANGLE OF ATTACK SENSORS, CHECK THAT THE DENTS ARE WITHIN AREODYNAMIC REQUIREMENTS, REFER TO PARAGRAPH 4.
Skin Plates - Allowable Dent Limits
Figure 102 (sheet 1)
53-00-
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T: IS THE SKIN THICKNESS IN DENTED AREA. IF DENT AFFECTS SEVERAL THICKNESSES, EACH OF THEM HAS TO BE CONSIDERED AND THE WORST LIMITATION HAS TO BE APPLIED.
D: IS THE MAXIMUM DEPTH OF THE SKIN DENT.
A: IS THE DISTANCE FROM THE LOCATION OF THE MAXIMUM DEPTH OF THE DENT TO THE EDGE OF ADJACENT STIFFENING MEMBER, SEE PROCEDURE A. WHEN THE DISTANCE ' A' CANNOT BE MEASURED FROM INSIDE, USE THE METHODE AS FOLLOWS, SEE PROCEDURE B.
- USE DISTANCE OF 15mm (0.59in.) BACK FROM THE FASTENER ROW AS A REFERENCE POINT (15mm (0.59in.) IS AN AVERAGE EDGE MARGIN).
- MEASURE THE DISTANCE FROM THE CENTER OF THE DENT TO THE REFERENCE POINT TO GET THE DISTANCE 'A'.
B: IS THE DISTANCE BETWEEN THE OUTER CONTOUR OF THE DENT AND ANY CUTOUT IN THE SKIN OR ANY FASTENER ROW.
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ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

The measurement is taken from outside, since there is no access from inside. The following values are deduced from the damage mapping:
- T is the skin thickness in dented area,
- D is the maximum depth of the skin dent,
- Distance B is the smallest distance measured from the dent edge to any fastener row (frame, stringer) or any cutout in the skin,
- Distance A is the smallest distance measured from the deepest point of the dent to the closest adjacent structure,
- Distance X is the smallest distance measured from the deepest point of the dent to the closest fastener row.

If no access from inside, the measurement is taken from outside, from the deepest point of the dent to closest fastener row (distance X).
Distance A will become the distance X - 15mm, which is the average considered edge margin.

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Damage Identification
Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
Allowable Damage Usage

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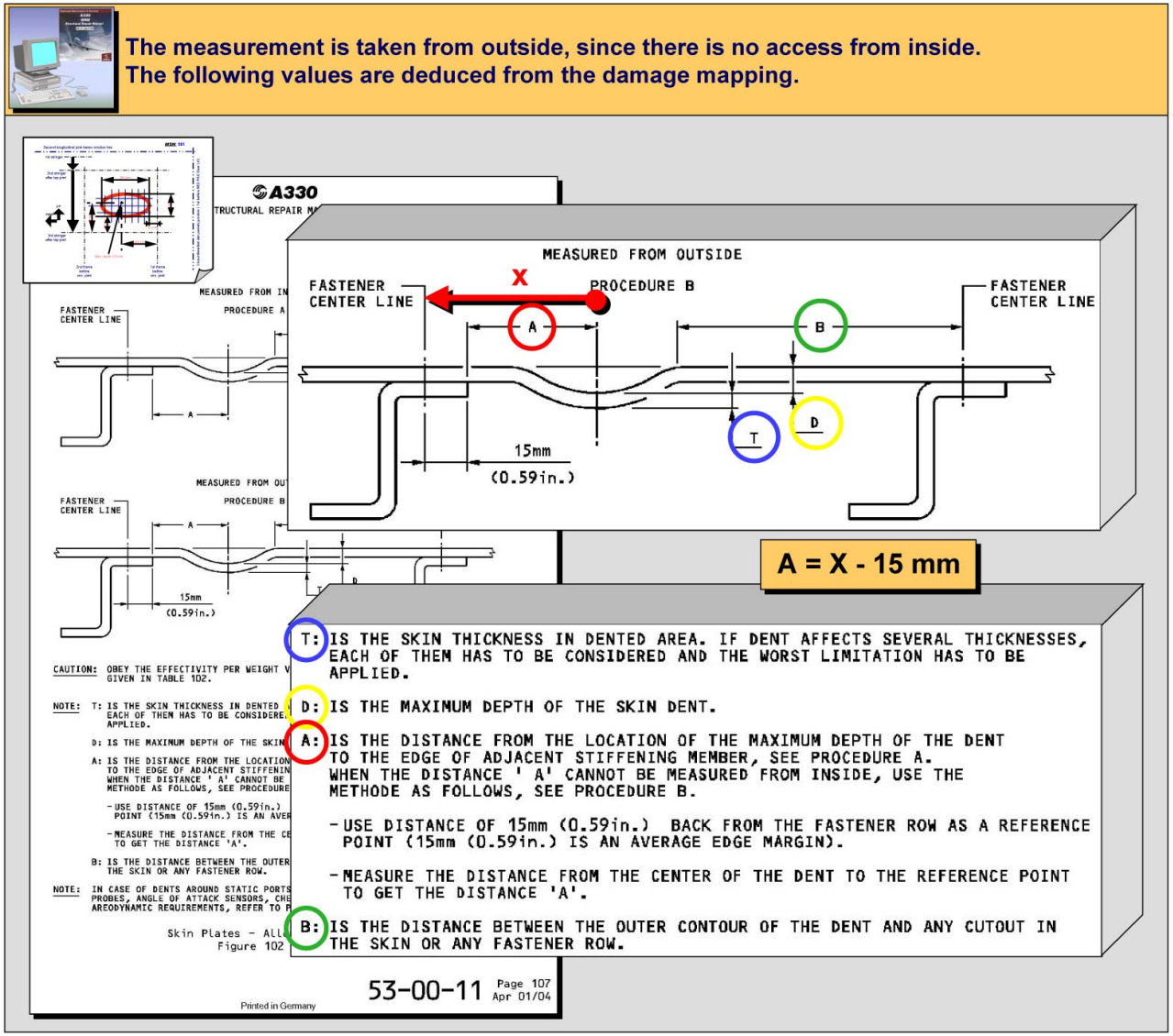

The measurement is taken from outside, since there is no access from inside.
The following values are deduced from the damage mapping.

A330
MEASURED FROM OUTSIDE
FASTENER CENTER LINE
X
PROCEDURE B
FASTENER CENTER LINE
A
B
T
D
15mm
(0.59in.)
A = X - 15 mm
T: IS THE SKIN THICKNESS IN DENTED AREA. IF DENT AFFECTS SEVERAL THICKNESSES, EACH OF THEM HAS TO BE CONSIDERED AND THE WORST LIMITATION HAS TO BE APPLIED.
D: IS THE MAXIMUM DEPTH OF THE SKIN DENT.
A: IS THE DISTANCE FROM THE LOCATION OF THE MAXIMUM DEPTH OF THE DENT TO THE EDGE OF ADJACENT STIFFENING MEMBER, SEE PROCEDURE A. WHEN THE DISTANCE ' A' CANNOT BE MEASURED FROM INSIDE, USE THE METHODE AS FOLLOWS, SEE PROCEDURE B.
- USE DISTANCE OF 15mm (0.59in.) BACK FROM THE FASTENER ROW AS A REFERENCE POINT (15mm (0.59in.) IS AN AVERAGE EDGE MARGIN).
- MEASURE THE DISTANCE FROM THE CENTER OF THE DENT TO THE REFERENCE POINT TO GET THE DISTANCE 'A'.
B: IS THE DISTANCE BETWEEN THE OUTER CONTOUR OF THE DENT AND ANY CUTOUT IN THE SKIN OR ANY FASTENER ROW.
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ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

Measure X distance; X = 65 mm (2.6 in). Since measured from outside, distance A = 65 mm - 15 mm = 50 mm (2 in). Measure distance B; B = 30 mm (1.18 in).

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Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
Allowable Damage Usage

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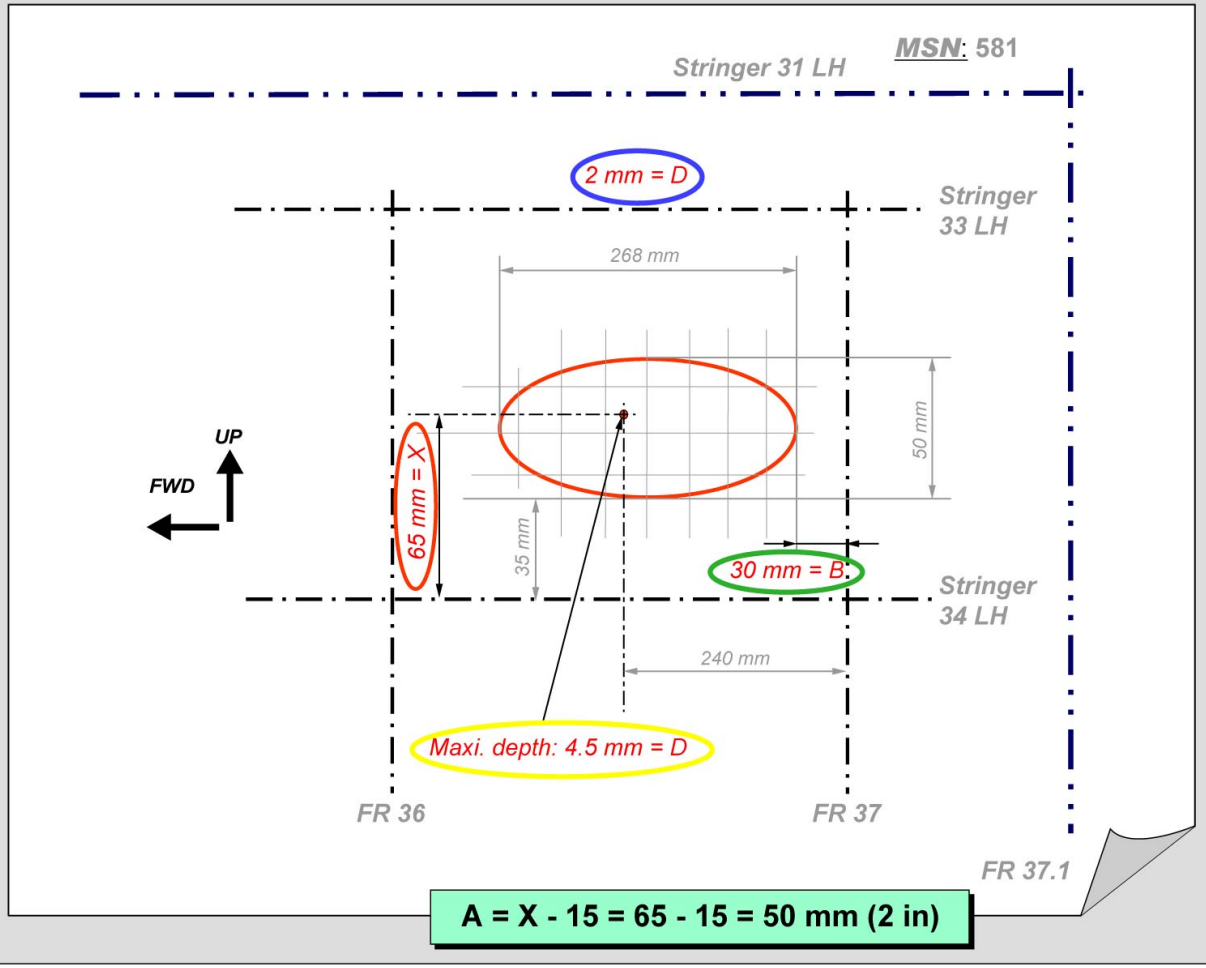
Measurement from the outside: value A is equal to X- 15 mm.



ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

This diagram (figure 102, sheet 2) enables to determine if the damage is allowable and the condition of allowability. A note deals with possible damage on internal structure; if yes, refer to the SRM chapter 53, page block 201.

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Damage Identification
Damage Geographical Location / Measurement
Detailed Location
Structure Identification
Allowable Damage Information
Allowable Damage Usage

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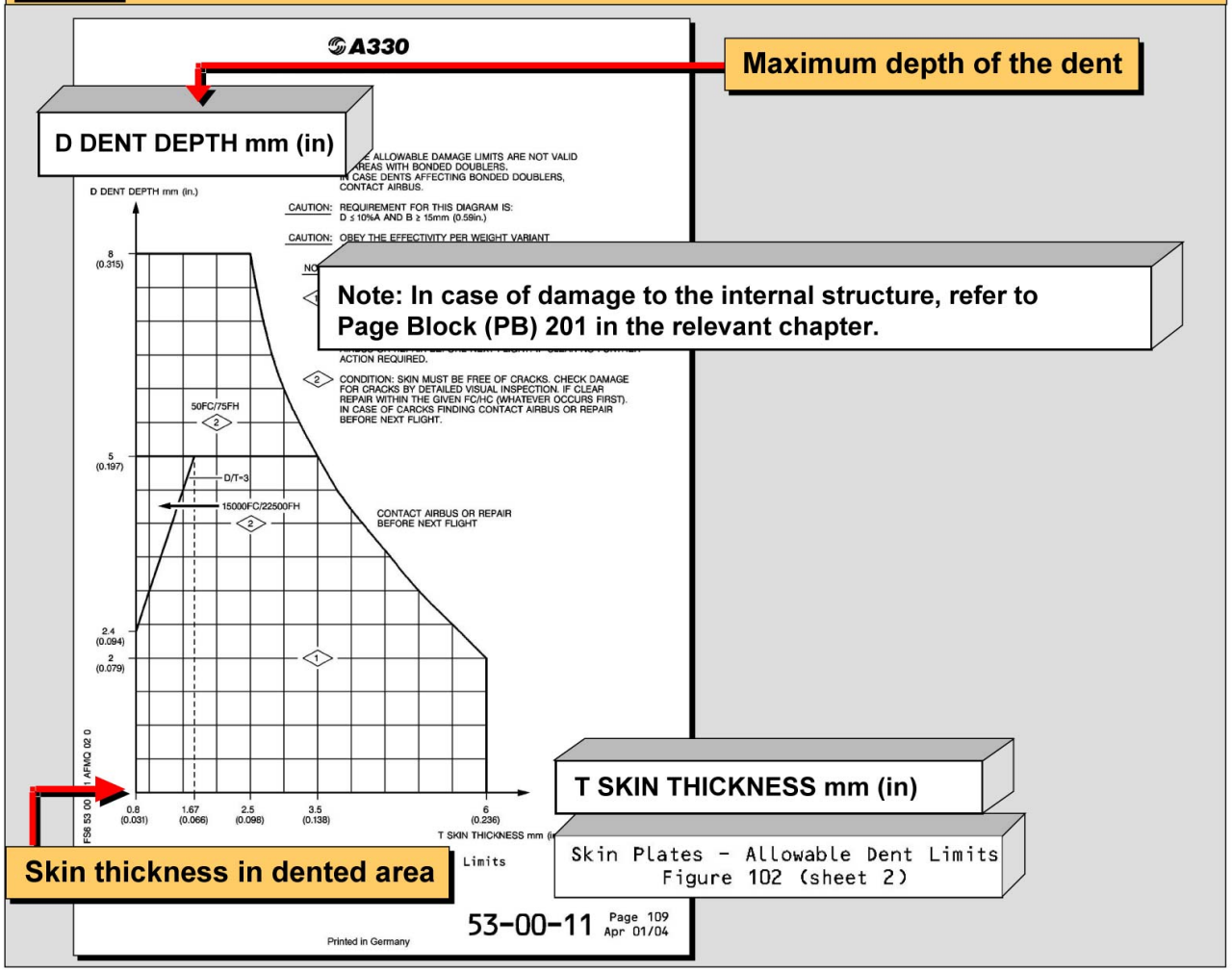
This diagram (figure 102, sheet 2) enables to determine if the damage is allowable and the condition of allowability.


A330
Maximum depth of the dent
D DENT DEPTH mm (in)
Note: In case of damage to the internal structure, refer to Page Block (PB) 201 in the relevant chapter.
T SKIN THICKNESS mm (in)
Skin thickness in dented area
Skin Plates - Allowable Dent Limits
Figure 102 (sheet 2)
53-00-11
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ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

Read carefully the caution which is: requirements for the use of this diagram is: D 10% A and B 15 mm (0.59 in); the first and the third caution have already been checked at an early stage.
Check these requirements:
- A = 50 mm (2 in); 10 % A = 5 mm > 4.5 mm: the first requirement is met,
- B = 30 mm (1.18 in) > 15 mm: the second requirement is met. The skin thickness in the dented area and the depth of the dent are the keys to get into to diagram. You must refer to the data collected before (damage mapping).

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Damage Identification

Damage Geographical Location / Measurement

Detailed Location

Structure Identification

Allowable Damage Information

Allowable Damage Usage

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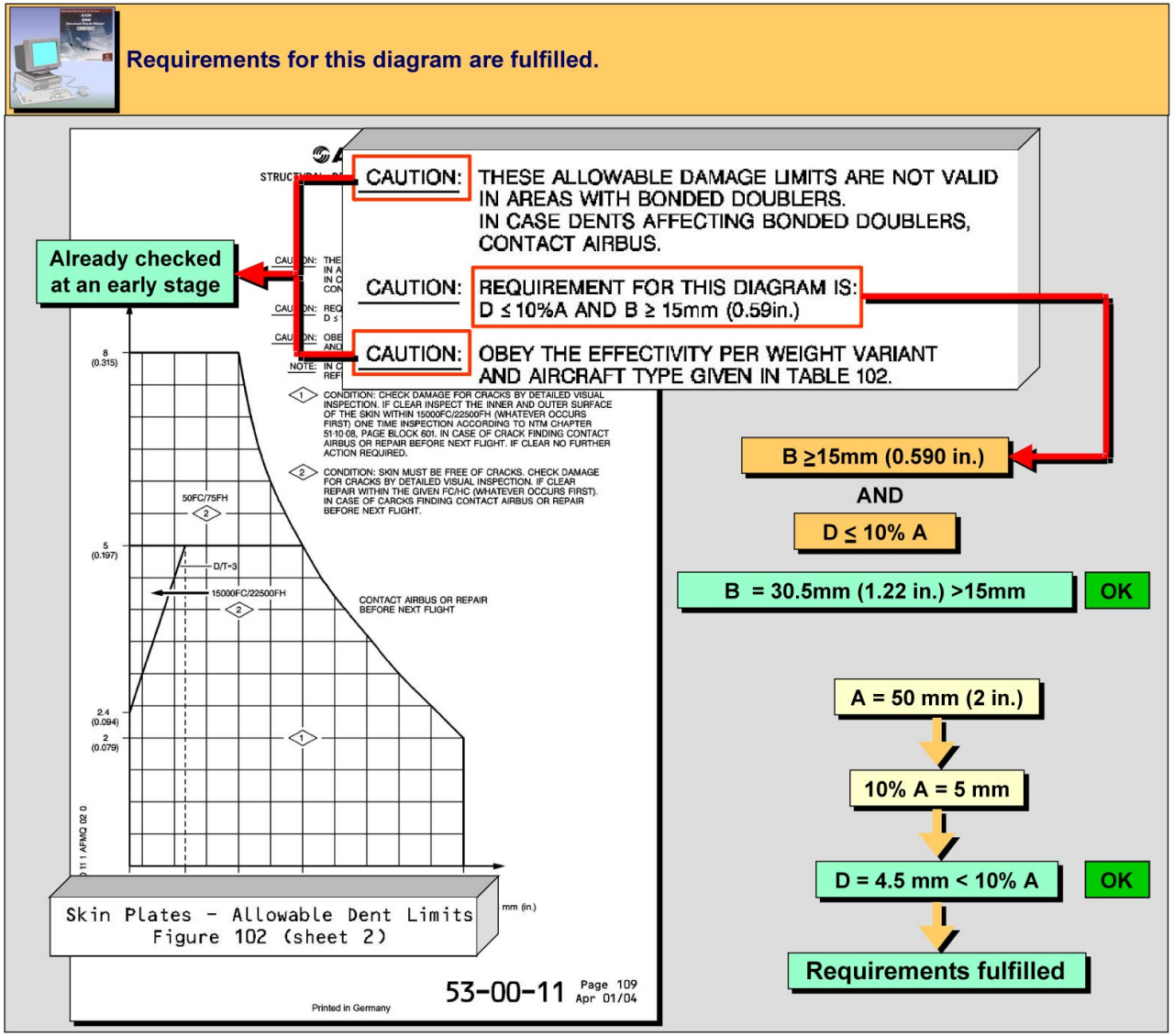
Requirements for this diagram are fulfilled.
CAUTION: THESE ALLOWABLE DAMAGE LIMITS ARE NOT VALID IN AREAS WITH BONDED DOUBLERS. IN CASE DENTS AFFECTING BONDED DOUBLERS, CONTACT AIRBUS.
CAUTION: REQUIREMENT FOR THIS DIAGRAM IS: D ≤ 10%A AND B ≥ 15mm (0.59in.)
CAUTION: OBEY THE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN TABLE 102.
Already checked at an early stage
CONDITION: CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR INSPECT THE INNER AND OUTER SURFACE OF THE SKIN WITHIN 15000FC/22500FH (WHATEVER OCCURS FIRST) ONE TIME INSPECTION ACCORDING TO NTM CHAPTER 51-10-08, PAGE BLOCK 601. IN CASE OF CRACK FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT. IF CLEAR NO FURTHER ACTION REQUIRED.
CONDITION: SKIN MUST BE FREE OF CRACKS. CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR REPAIR WITHIN THE GIVEN FC/HC (WHATEVER OCCURS FIRST). IN CASE OF CARCKS FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT.
50FC/75FH
D/T=3
15000FC/22500FH
CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT
8 (0.315)
5 (0.197)
2.4 (0.094)
2 (0.079)
mm (in.)
Skin Plates - Allowable Dent Limits
Figure 102 (sheet 2)
53-00-11
Page 109
Apr 01/04
Printed in Germany
B ≥15mm (0.590 in.)
AND
D ≤ 10% A
B = 30.5mm (1.22 in.) >15mm
OK
A = 50 mm (2 in.)
10% A = 5 mm
D = 4.5 mm < 10% A
OK
Requirements fulfilled

ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EXAMPLE 1 D/O (3)

ALLOWABLE DAMAGE INFORMATION (continued)

CONT'D

The skin thickness in the dented area is 2.0 mm (found in the identification pages).
The depth of the dent is 4.5 mm (measured from the A/C damage mapping). These two values are plotted onto the diagram, which defines a point. The area where this point is located defines the subsequent actions to be performed. For the concerned dent: "check damage for cracks by detailed visual inspection. If clear inspect the inner and outer surface of the skin within 15000 Flight Cycles (FC) / 22500 Flight Hours (FH) (whatever occurs first) one time inspection according to NTM chapter 51-10-08, page block 601. In case of crack finding contact Airbus or repair before next flight. If clear no further action required".

G4J06491 - G0UT1M0 - FM51DG000000001

- Damage Identification
- Damage Geographical Location / Measurement
- Detailed Location
- Structure Identification
- Allowable Damage Information
- Allowable Damage Usage

Structural Repair Manual

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- Alphanumeric Index
- Chapter SRI
- Chapter 51
- Chapter 52
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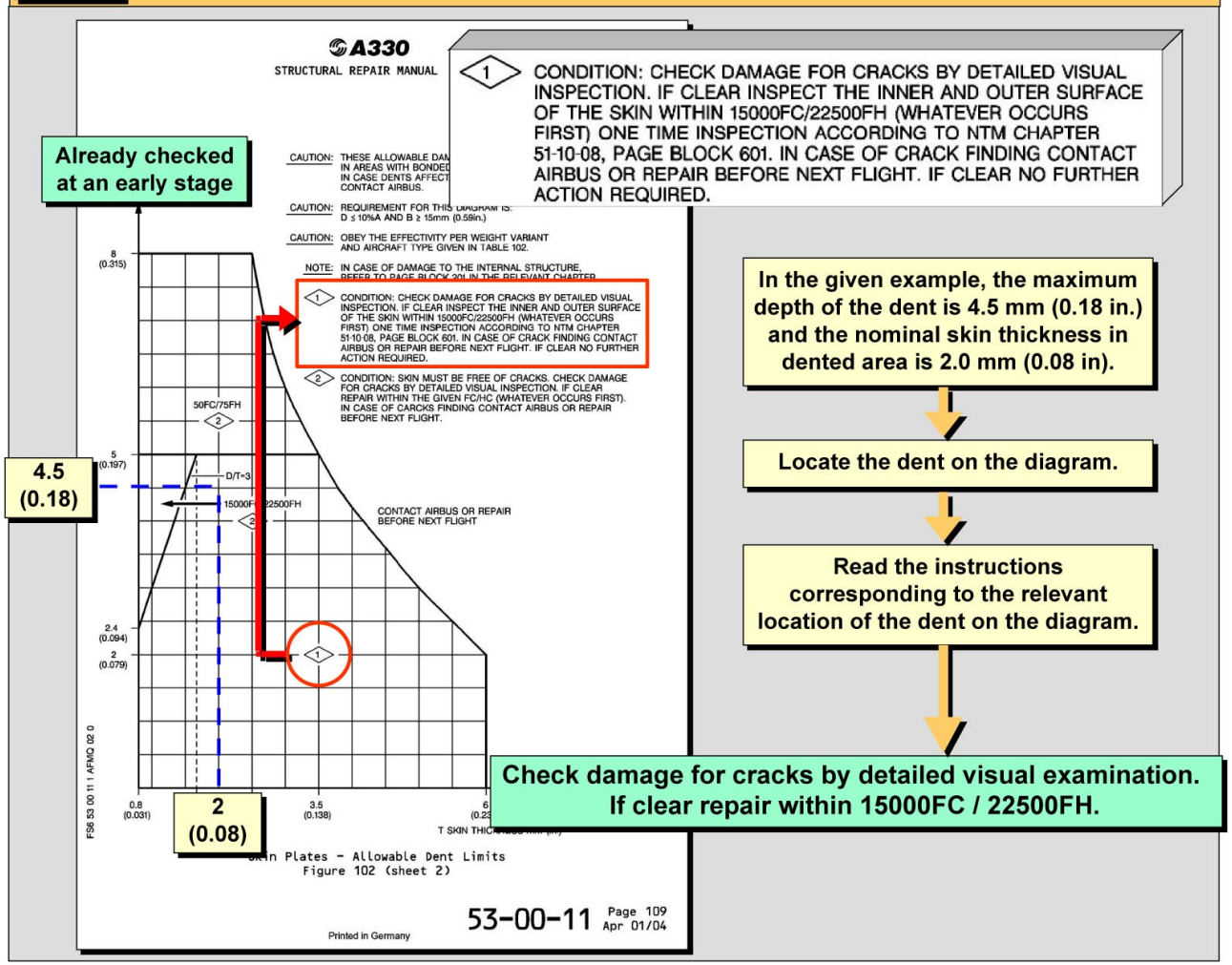
  - 53-1...
  - **53-2...**
    - 53-20-00 – 001
    - 53-21-00 – 001
    - 53-21-11 – 001
    - **53-21-11 – 101**
    - 53-21-11 – 201
    - 53-21-12 – 001
    - 53-21-12 – 101
    - 53-21-12 – 201
    - 53-21-13 – 001
    - 53-2 -...
- Chapter 54
- Chapter 55

Two values, the skin thickness in the dented area and the depth of the dent, are plotted onto the diagram, which defines a point. The area where this point is located defines the subsequent actions to be performed.


A330
STRUCTURAL REPAIR MANUAL
1
CONDITION: CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR INSPECT THE INNER AND OUTER SURFACE OF THE SKIN WITHIN 15000FC/22500FH (WHATEVER OCCURS FIRST) ONE TIME INSPECTION ACCORDING TO NTM CHAPTER 51-10-08, PAGE BLOCK 601. IN CASE OF CRACK FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT. IF CLEAR NO FURTHER ACTION REQUIRED.
Already checked at an early stage
CAUTION: THESE ALLOWABLE DAM
IN AREAS WITH BONDED
IN CASE DENTS AFFECT
CONTACT AIRBUS.
CAUTION: REQUIREMENT FOR THIS DIAGRAM IS:
D ≤ 10%A AND B ≥ 15mm (0.59in.)
CAUTION: OBEY THE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN TABLE 102.
NOTE: IN CASE OF DAMAGE TO THE INTERNAL STRUCTURE,
CONDITION: CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR INSPECT THE INNER AND OUTER SURFACE OF THE SKIN WITHIN 15000FC/22500FH (WHATEVER OCCURS FIRST) ONE TIME INSPECTION ACCORDING TO NTM CHAPTER 51-10-08, PAGE BLOCK 601. IN CASE OF CRACK FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT. IF CLEAR NO FURTHER ACTION REQUIRED.
CONDITION: SKIN MUST BE FREE OF CRACKS. CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR REPAIR WITHIN THE GIVEN FC/HC (WHATEVER OCCURS FIRST). IN CASE OF CARCKS FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT.
50FC/75FH
D/T=3
15000FC/22500FH
CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT
8 (0.315)
5 (0.197)
2.4 (0.094)
2 (0.079)
0.8 (0.031)
3.5 (0.138)
4.5 (0.18)
2 (0.08)
In the given example, the maximum depth of the dent is 4.5 mm (0.18 in.) and the nominal skin thickness in dented area is 2.0 mm (0.08 in).
Locate the dent on the diagram.
Read the instructions corresponding to the relevant location of the dent on the diagram.
Check damage for cracks by detailed visual examination. If clear repair within 15000FC / 22500FH.
Skin Plates - Allowable Dent Limits
Figure 102 (sheet 2)
53-00-11
Page 109
Apr 01/04
Printed in Germany

ALLOWABLE DAMAGE INFORMATION - CONT'D

DAMAGE ASSESSMENT EX. 1 OPERATIONAL SCENARIO (3)

SESSION OBJECTIVES

SESSION SET-UP

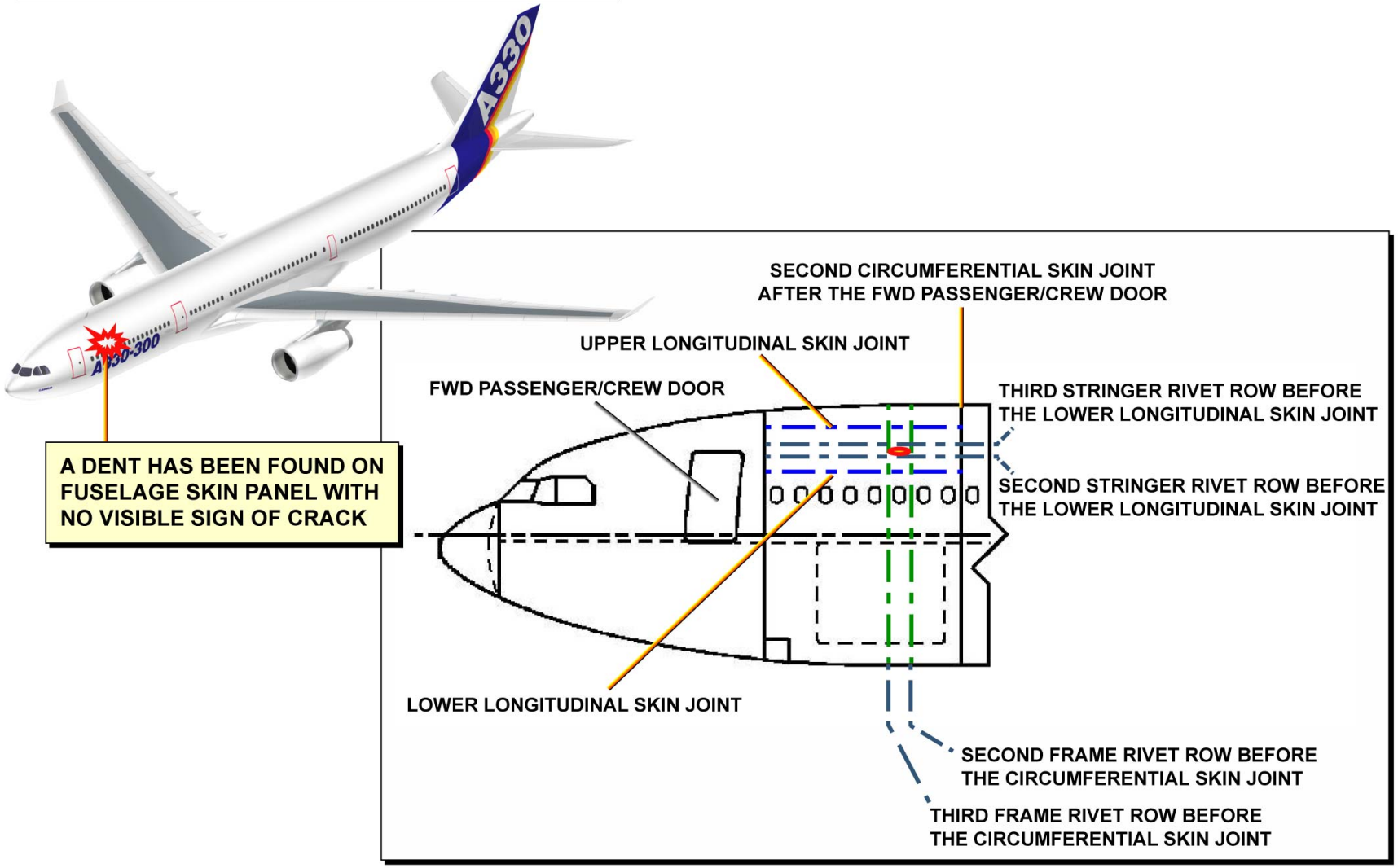
DAMAGE ASSESSMENT PROCEDURE

- **IDENTIFICATION OF THE DAMAGE**
- **DETAIL IDENTIFICATION OF THE DAMAGE PART**
- **ALLOWABLE DAMAGE - GENERAL**
- **DAMAGE CRITERIA**
- **DENT MEASUREMENT PROCEDURE**
- **DENT MEASUREMENT**
- **ALLOWABLE DENT DIAGRAM**
- **CONCLUSION**

DAMAGE LOCATION

G4J06491 - G0UT1M0 - FM5122000000001

ASSUMPTION: MSN 581 STD 8, WEIGHT VARIANT: 020


A330
A330-300
A DENT HAS BEEN FOUND ON FUSELAGE SKIN PANEL WITH NO VISIBLE SIGN OF CRACK
SECOND CIRCUMFERENTIAL SKIN JOINT AFTER THE FWD PASSENGER/CREW DOOR
UPPER LONGITUDINAL SKIN JOINT
FWD PASSENGER/CREW DOOR
THIRD STRINGER RIVET ROW BEFORE THE LOWER LONGITUDINAL SKIN JOINT
SECOND STRINGER RIVET ROW BEFORE THE LOWER LONGITUDINAL SKIN JOINT
LOWER LONGITUDINAL SKIN JOINT
SECOND FRAME RIVET ROW BEFORE THE CIRCUMFERENTIAL SKIN JOINT
THIRD FRAME RIVET ROW BEFORE THE CIRCUMFERENTIAL SKIN JOINT

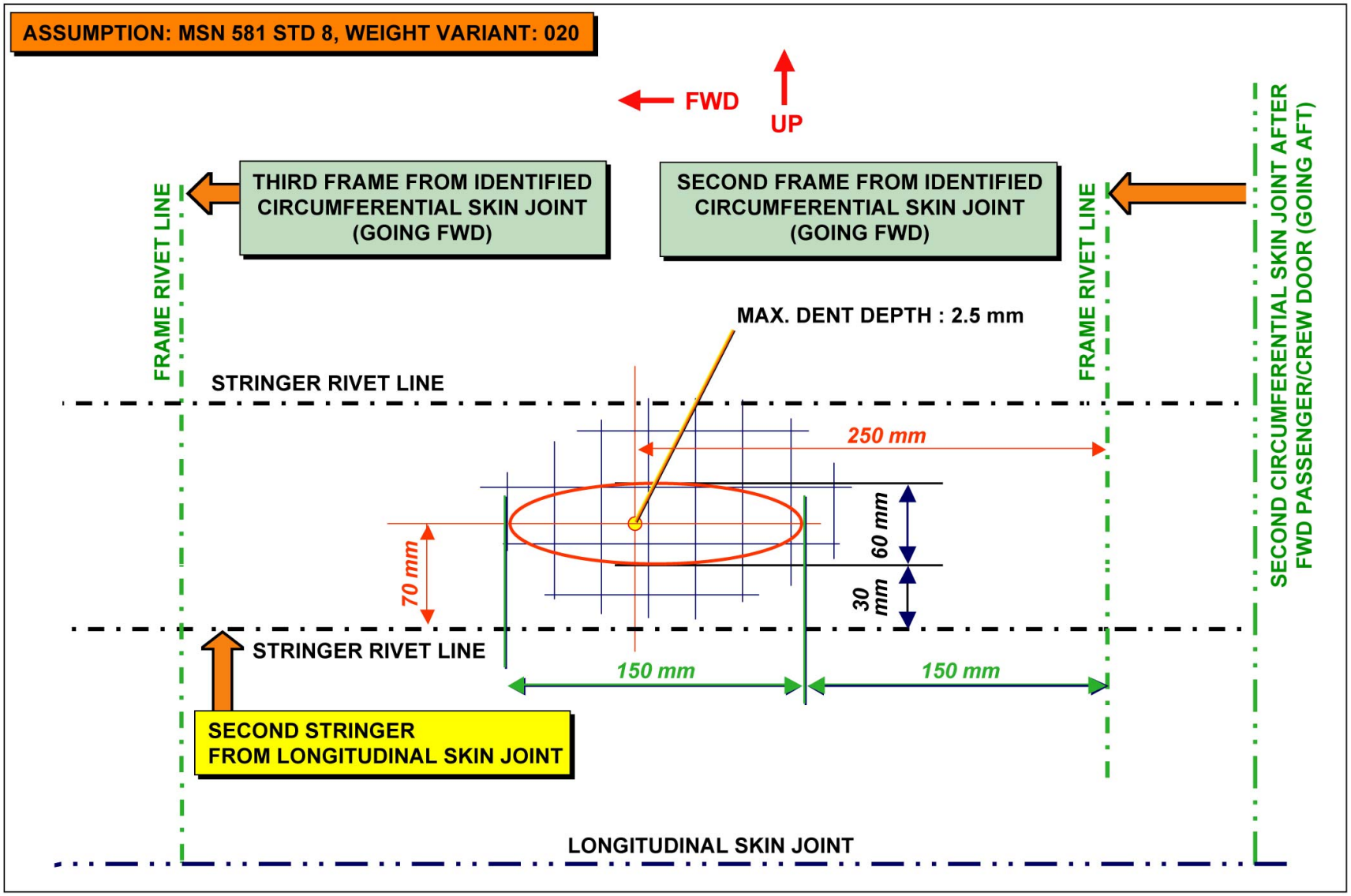
SESSION OBJECTIVES ... DAMAGE LOCATION

DAMAGE ASSESSMENT EX. 1 OPERATIONAL SCENARIO (3)

MAPPING

DRAFT

G4J06491 - G0UT1M0 - FM5122000000001


ASSUMPTION: MSN 581 STD 8, WEIGHT VARIANT: 020
FWD
UP
THIRD FRAME FROM IDENTIFIED CIRCUMFERENTIAL SKIN JOINT (GOING FWD)
SECOND FRAME FROM IDENTIFIED CIRCUMFERENTIAL SKIN JOINT (GOING FWD)
FRAME RIVET LINE
FRAME RIVET LINE
SECOND CIRCUMFERENTIAL SKIN JOINT AFTER FWD PASSENGER/CREW DOOR (GOING AFT)
MAX. DENT DEPTH : 2.5 mm
STRINGER RIVET LINE
250 mm
70 mm
60 mm
30 mm
STRINGER RIVET LINE
150 mm
150 mm
SECOND STRINGER FROM LONGITUDINAL SKIN JOINT
LONGITUDINAL SKIN JOINT

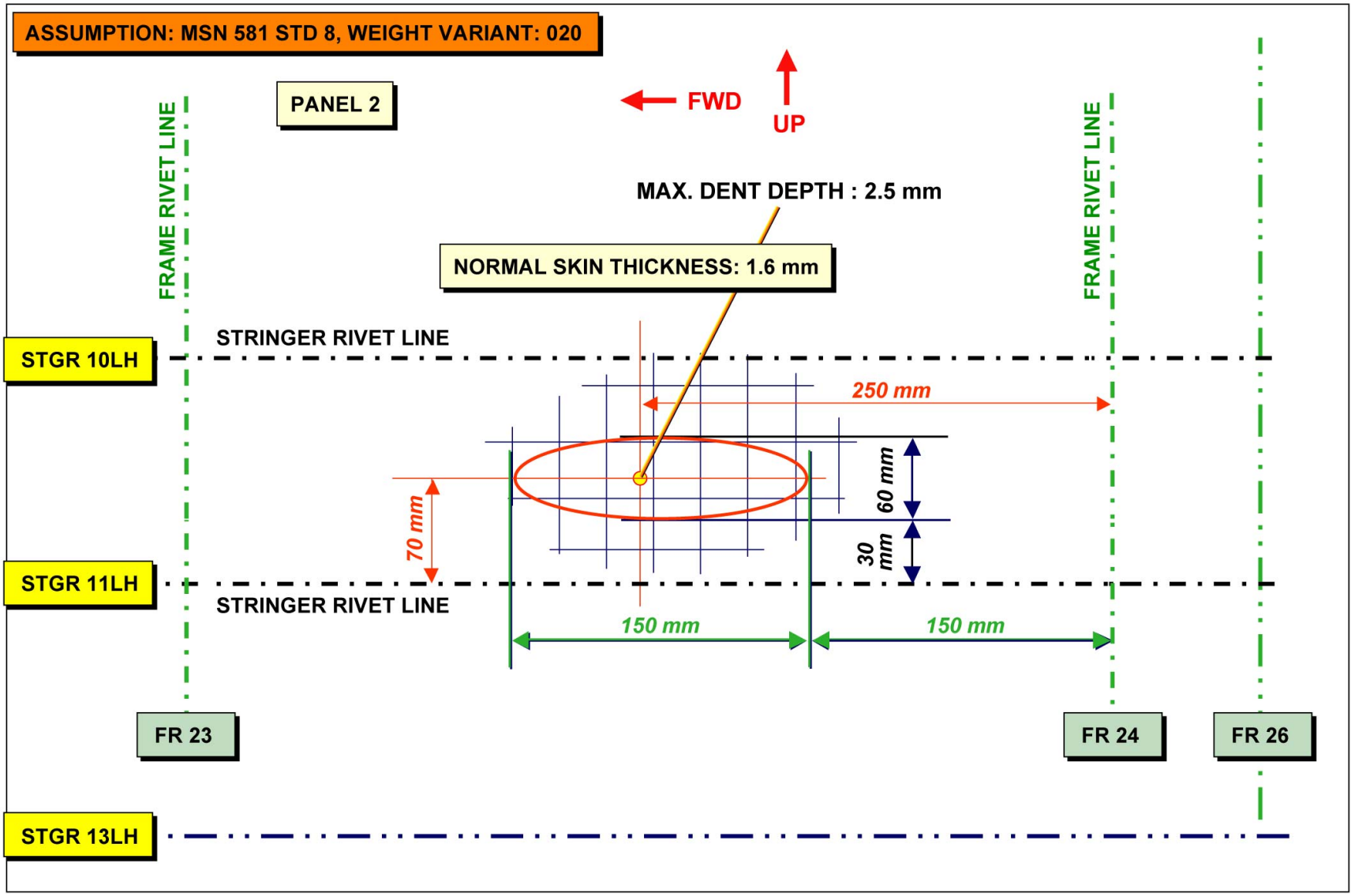
MAPPING - DRAFT

DAMAGE ASSESSMENT EX. 1 OPERATIONAL SCENARIO (3)

MAPPING (continued)

FINALIZATION

G4J06491 - G0UT1M0 - FM5122000000001



MAPPING - FINALIZATION

DAMAGE ASSESSMENT EX. 1 OPERATIONAL SCENARIO (3)

ALLOWABLE DENT DIAGRAM

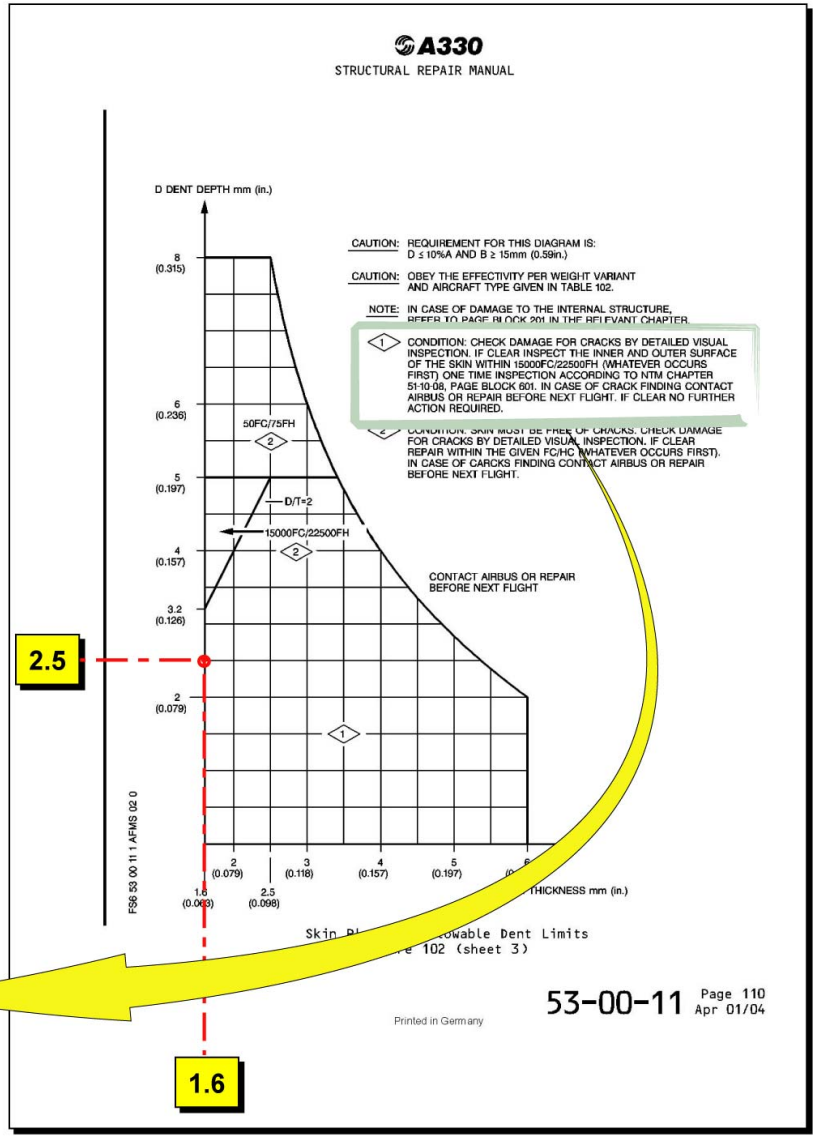
G4J06491 - G0UT1M0 - FM5122000000001

IN THE GIVEN EXAMPLE, THE MAXIMUM DEPTH OF THE DENT IS 2.5 mm AND THE NOMINAL SKIN THICKNESS IN DENTED AREA IS 1.6 mm.

LOCATE THE DENT ON THE DIAGRAM.

READ THE INSTRUCTIONS CORRESPONDING TO THE RELEVANT LOCATION OF THE DENT ON THE DIAGRAM.

CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR INSPECT THE INNER AND OUTER SURFACE OF THE SKIN WITHIN 15000 FC/22500 FH (WHATEVER OCCURS FIRST) ONE TIME INSPECTION, ACCORDING TO NTM CHAPTER 51-10-08, PAGE BLOCK 601. IN CASE OF CRACK FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT. IF CLEAR NO FURTHER ACTION REQUIRED.


A330
STRUCTURAL REPAIR MANUAL
D DENT DEPTH mm (in.)
8 (0.315)
6 (0.236)
5 (0.197)
4 (0.157)
3.2 (0.126)
2 (0.079)
50FC/75FH
D/T=2
15000FC/22500FH
CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT
CAUTION: REQUIREMENT FOR THIS DIAGRAM IS: D ≤ 10%A AND B ≥ 15mm (0.59in.)
CAUTION: OBEY THE EFFECTIVITY PER WEIGHT VARIANT AND AIRCRAFT TYPE GIVEN IN TABLE 102.
NOTE: IN CASE OF DAMAGE TO THE INTERNAL STRUCTURE, REFER TO PAGE BLOCK 201 IN THE RELEVANT CHAPTER.
1 CONDITION: CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR INSPECT THE INNER AND OUTER SURFACE OF THE SKIN WITHIN 15000FC/22500FH (WHATEVER OCCURS FIRST) ONE TIME INSPECTION ACCORDING TO NTM CHAPTER 51-10-08, PAGE BLOCK 601. IN CASE OF CRACK FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT. IF CLEAR NO FURTHER ACTION REQUIRED.
2 CONDITION: SKIN MUST BE FREE OF CRACKS. CHECK DAMAGE FOR CRACKS BY DETAILED VISUAL INSPECTION. IF CLEAR REPAIR WITHIN THE GIVEN FC/HC WHATEVER OCCURS FIRST). IN CASE OF CARCKS FINDING CONTACT AIRBUS OR REPAIR BEFORE NEXT FLIGHT.
2.5
1.6
2 (0.079)
3 (0.118)
4 (0.157)
5 (0.197)
1.6 (0.063)
2.5 (0.098)
THICKNESS mm (in.)
FS6 53 00 11 1 AFMS 02 0
Allowable Dent Limits
102 (sheet 3)
53-00-11 Page 110 Apr 01/04
Printed in Germany

ALLOWABLE DENT DIAGRAM

DAMAGE ASSESSMENT EX. 2 OPERATIONAL SCENARIO (3)

SESSION OBJECTIVES

SESSION SET-UP

DAMAGE ASSESSMENT PROCEDURE

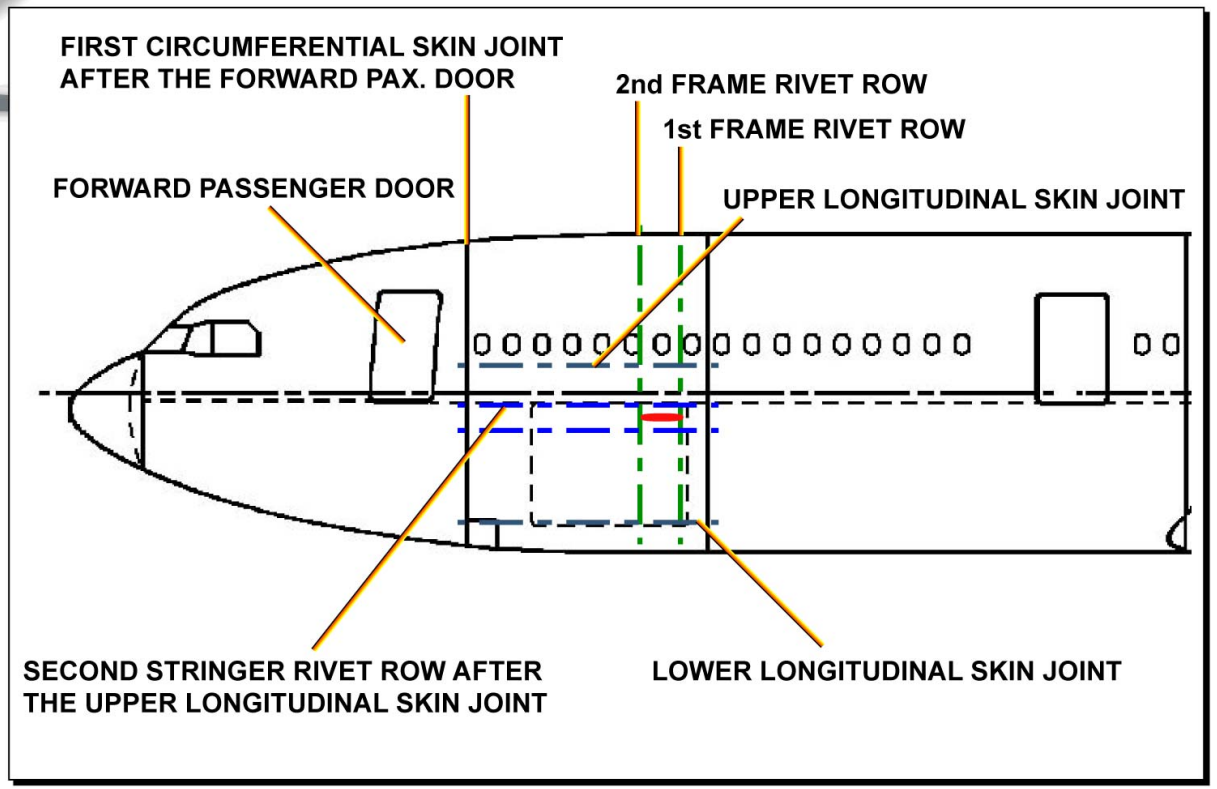
- **DAMAGE IDENTIFICATION/LOCATION**
- **DETAILED IDENTIFICATION OF THE DAMAGED PART**
- **ALLOWABLE DAMAGE - GENERAL**
- **DAMAGE CRITERIA**
- **ALLOWABLE DAMAGE USAGE/FINAL DECISION**
- **CONCLUSION**

DAMAGE LOCATION

G4J06491 - G0UT1M0 - FM5124000000001

ASSUMPTION: MSN 581 STD 8, WEIGHT VARIANT: 020

A SCRATCH HAS BEEN FOUND ON FUSELAGE SKIN PANEL WITH NO VISIBLE SIGN OF CRACK


FIRST CIRCUMFERENTIAL SKIN JOINT AFTER THE FORWARD PAX. DOOR
2nd FRAME RIVET ROW
1st FRAME RIVET ROW
FORWARD PASSENGER DOOR
UPPER LONGITUDINAL SKIN JOINT
SECOND STRINGER RIVET ROW AFTER THE UPPER LONGITUDINAL SKIN JOINT
LOWER LONGITUDINAL SKIN JOINT

SESSION OBJECTIVES ... DAMAGE LOCATION

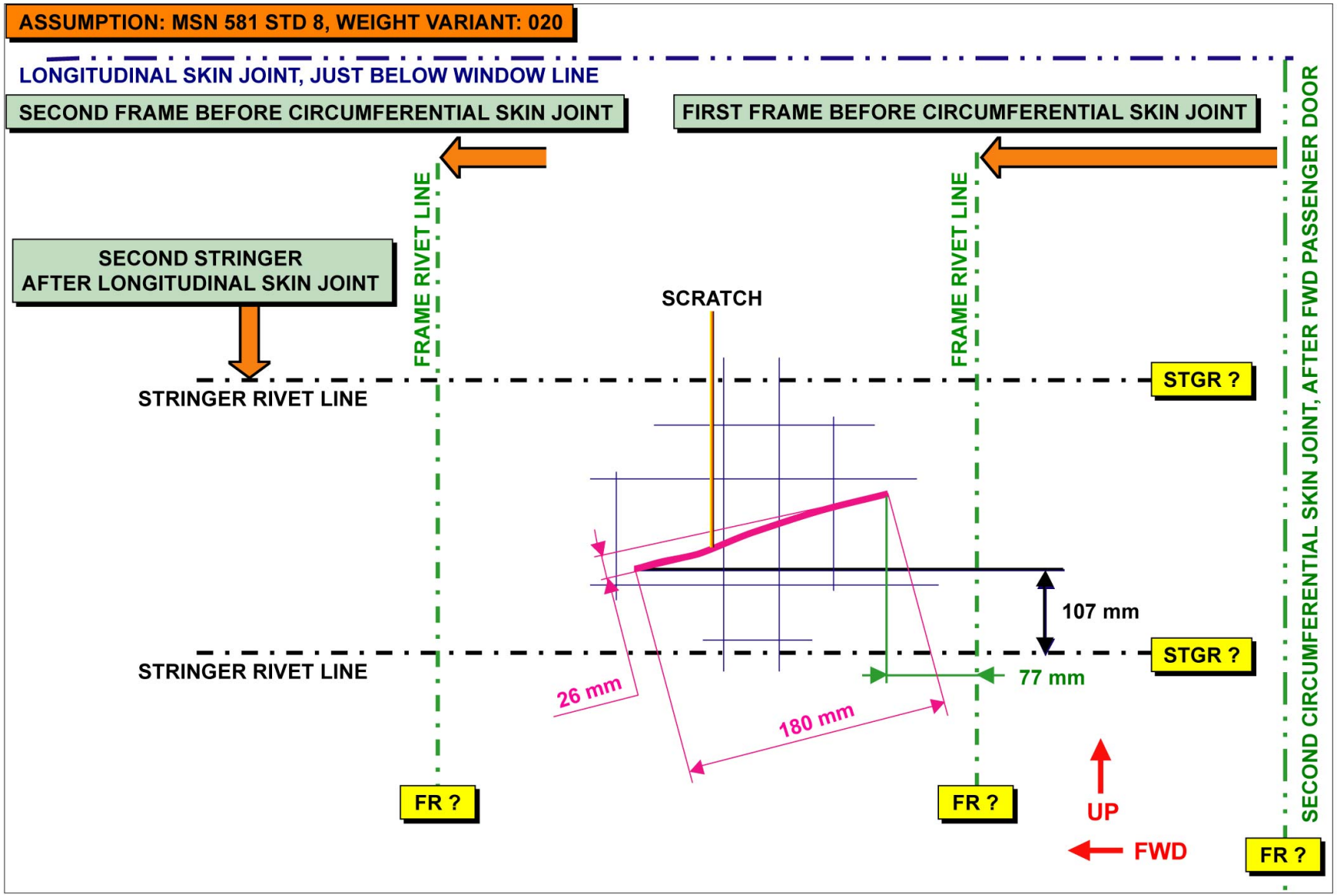
G4J06491 - G0UT1M0 - FM5124000000001

DAMAGE ASSESSMENT EX. 2 OPERATIONAL SCENARIO (3)

MAPPING

DRAFT

G4J06491 - G0UT1M0 - FM5124000000001



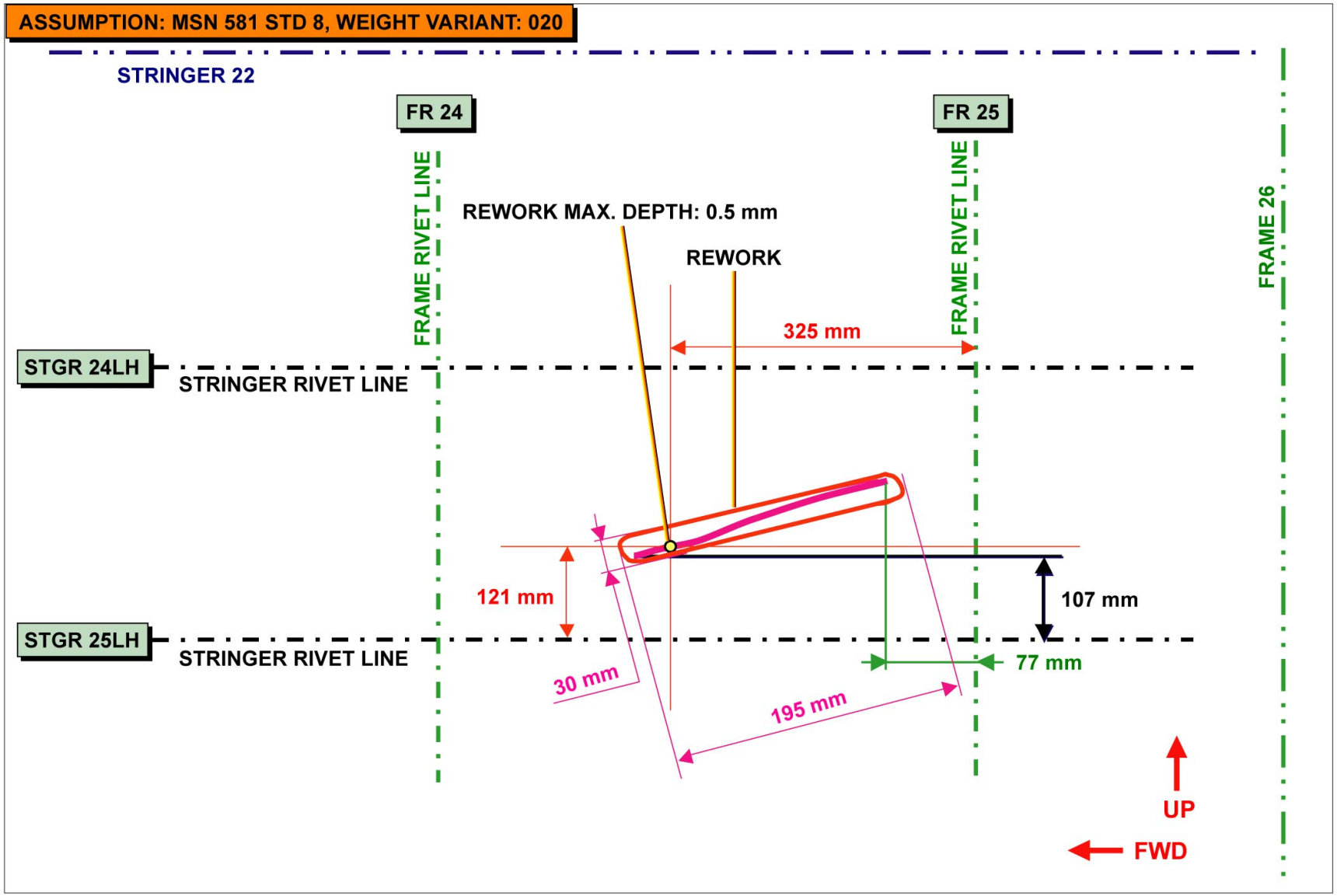
MAPPING - DRAFT

DAMAGE ASSESSMENT EX. 2 OPERATIONAL SCENARIO (3)

MAPPING (continued)

FINALIZATION

G4J06491 - G0UT1M0 - FM5124000000001

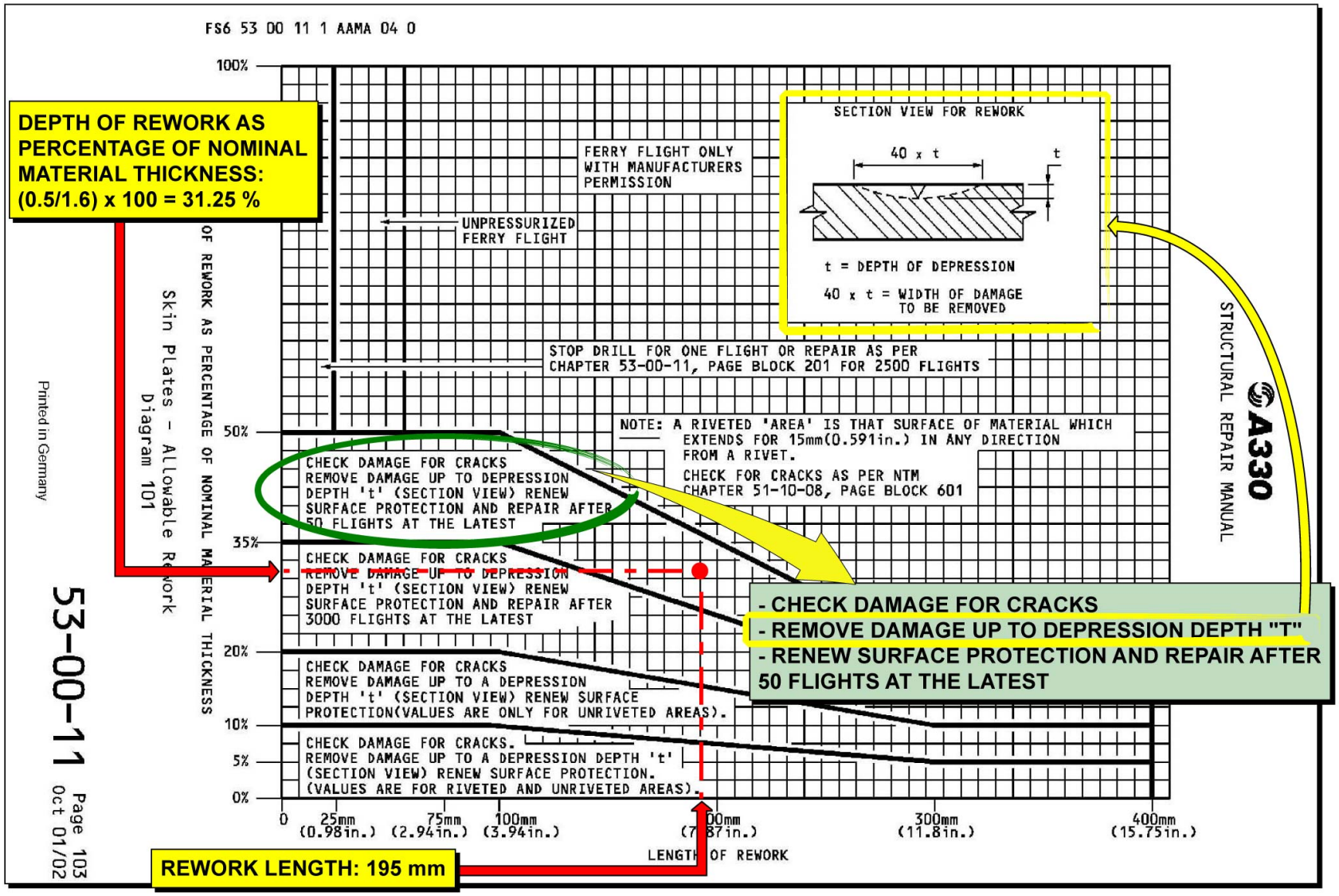


MAPPING - FINALIZATION

DAMAGE ASSESSMENT EX. 2 OPERATIONAL SCENARIO (3)

ALLOWABLE REWORK DIAGRAM

G4J06491 - G0UT1M0 - FM5124000000001


FS6 53 00 11 1 AAMA 04 0
DEPTH OF REWORK AS PERCENTAGE OF NOMINAL MATERIAL THICKNESS:
(0.5/1.6) x 100 = 31.25 %
100%
50%
35%
20%
10%
5%
0%
FERRY FLIGHT ONLY WITH MANUFACTURERS PERMISSION
UNPRESSURIZED FERRY FLIGHT
SECTION VIEW FOR REWORK
40 x t
t
t = DEPTH OF DEPRESSION
40 x t = WIDTH OF DAMAGE TO BE REMOVED
STOP DRILL FOR ONE FLIGHT OR REPAIR AS PER CHAPTER 53-00-11, PAGE BLOCK 201 FOR 2500 FLIGHTS
NOTE: A RIVETED 'AREA' IS THAT SURFACE OF MATERIAL WHICH EXTENDS FOR 15mm(0.591in.) IN ANY DIRECTION FROM A RIVET.
CHECK FOR CRACKS AS PER NTM CHAPTER 51-10-08, PAGE BLOCK 601
CHECK DAMAGE FOR CRACKS
REMOVE DAMAGE UP TO DEPRESSION DEPTH 't' (SECTION VIEW) RENEW SURFACE PROTECTION AND REPAIR AFTER 50 FLIGHTS AT THE LATEST
CHECK DAMAGE FOR CRACKS
REMOVE DAMAGE UP TO DEPRESSION DEPTH 't' (SECTION VIEW) RENEW SURFACE PROTECTION AND REPAIR AFTER 3000 FLIGHTS AT THE LATEST
CHECK DAMAGE FOR CRACKS
REMOVE DAMAGE UP TO A DEPRESSION DEPTH 't' (SECTION VIEW) RENEW SURFACE PROTECTION(VALUES ARE ONLY FOR UNRIVETED AREAS).
CHECK DAMAGE FOR CRACKS.
REMOVE DAMAGE UP TO A DEPRESSION DEPTH 't' (SECTION VIEW) RENEW SURFACE PROTECTION.
(VALUES ARE FOR RIVETED AND UNRIVETED AREAS).
- CHECK DAMAGE FOR CRACKS
- REMOVE DAMAGE UP TO DEPRESSION DEPTH "T"
- RENEW SURFACE PROTECTION AND REPAIR AFTER 50 FLIGHTS AT THE LATEST
0
25mm (0.98in.)
75mm (2.94in.)
100mm (3.94in.)
300mm (11.8in.)
400mm (15.75in.)
LENGTH OF REWORK
REWORK LENGTH: 195 mm
Skin Plates - Allowable Rework
Diagram 101
Printed in Germany
53-00-11
Page 103
Oct 01/02
A330
STRUCTURAL REPAIR MANUAL

ALLOWABLE REWORK DIAGRAM

AIRBUS

AIRBUS S.A.S.
31707 BLAGNAC cedex, FRANCE
STM
REFERENCE G4J06491
DECEMBER 2006
PRINTED IN FRANCE
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